BOOK 2 OF 2

public works & infrastructure
Department:
Public Works and Infrastructure
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TENDER: H20/025 Al

LAND PORTS OF ENTRY: PEKA BRIDGE AND MONANTSA PASS: APPOINTMENT OF A SERVICE PROVIDER/S FOR THE MAINTENANCE AND REPAIRS OF BUILDINGS, CIVIL, MECHANICAL AND ELECTRICAL INFRASTRUCTURE AND INSTALLATION FOR A PERIOD OF 36 MONTHS

TENDER DOCUMENT

FEBRUARY 2020

ISSUED BY:

THE DIRECTOR GENERAL

DEPARTMENT OF PUBLIC WORKS AND
INFRASTRUCTURE
PRIVATE BAG X65
PRETORIA
0001

NAME OF TENDERER: .....

PG-01.1 (EC) SCOPE OF WORKS – (GCC (2010) 2nd EDITION: 2010)

Project title:	***LAND PORTS OF ENTRY: PEKA BRIDGE AND MONANTSA PASS: APPOINTMENT OF A SERVICE PROVIDER/S FOR THE MAINTENANCE AND REPAIRS OF BUILDINGS, CIVIL, MECHANICAL AND ELECTRICAL INFRASTRUCTURE AND INSTALLATION FOR A PERIOD OF 36 MONTHS***		
Tender no:	***H20/025 AI***	**Reference no:**	***H20/025 AI***

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C3.1 STANDARD SPECIFICATIONS:

The standard specifications on which this contract is based are the **South African Bureau of Standards Standardized Specifications for Civil Engineering Construction SABS 1200.** *(Note to compiler. "SABS" has been changed to "SANS"; the SABS 1200 specifications are due to be replaced in the foreseeable future by SANS 2100)*

Although not bound in nor issued with this Document, the following Sections of the Standardized Specifications of SABS 1200 shall form part of this Contract:

1. SABS 1200 - Standardised Specifications for Civil Engineering Construction*
2. SABS - Standard Specifications*
3. PW 371 - Specification of Materials and Methods to be used. Fourth revision, October 1993.**
4. Guide for architects concerning drainage, water supply and stormwater drainage**
5. PW 343 - Building specifications for Regional Offices**
6. Standard Specification for the Electrical Equipment and Installation for Mechanical Services, Issue VIII December 1984**
7. Standard Electrical Specifications, January 1984, GPS 24-0367**
8. SANS 10400 - The application of the National Building Regulations**
9. Department of Public Works - Standard Electrical Specifications**
10. Standard Specifications for Air Conditioning and Ventilation Installations – Issue XI, 1998**
11. Standard Specifications for Refrigeration Services – Issue VII, 1998**
12. FPO/G61/3E Guide for Architects**
13. Department of Water Affairs – Green Drop * Blue Drop Requirements (Version 1.0-2010)**
14. Guideline for the Implementation of Labour – Intensive Infrastructure Projects under Expanded Public Works Programme**

***** Not issued with this document, but available at the Contractor's expense from SA Bureau of Standards, Private Bag X191, Pretoria, 0001.

****** Not issued with this document, but available from the Director General, Department of Public Works, Private Bag X65, Pretoria, 0001, or any office of the Regional Representative of this Department

******* Not issued with this document, but available from the Department of Water Affairs (www.dwa.gov.za)

C3.2 PROJECT SPECIFICATIONS:

Status

The Project Specification, consisting of two parts, forms an integral part of the contract and supplements the Standard Specifications.

Part A contains a general description of the works, the site and the requirements to be met.

Part B contains variations, amendments and additions to the Standardized Specifications.

In the event of any discrepancy between a part or parts of the Standardised of Particular Specifications and the Project Specification, the Project Specification shall take precedence. In the event of a discrepancy between the specifications, (including the Project Specifications) and the drawings and / or the Bill of Quantities, the discrepancy shall be resolved by the Engineer before the execution of the work under the relevant item.

A GENERAL

PS 1 GENERAL DESCRIPTION:

Each installation requires work that may include any one or more of the activities as set out below: i.e. decommissioning, repair, reconditioning, testing, re-commissioning and maintenance during the 36-month Contract. The work also include compilation of operating and maintenance manuals as well as training of User Client operators and all maintenance personnel.

NOTE: Repair and maintenance work will be carried out within facilities that are occupied by User Client's personnel and associates.

PS 2 DESCRIPTION OF SITE AND ACCESS

PEKA AND MONANTSA Ports of Entry is the property of the Department of Public Works. The location of the sites are described below:

PEKA Port of Entry is situated on the border between South Africa and Lesotho. The Port of Entry is approximately 19km east of Clocolan in the Free State Province.

MONANTSA Port of Entry is situated on the border between South Africa and Lesotho. The Port of Entry is approximately 42 kilometres south of Kestell in the Free State province

PS 3 DETAILS OF THE CONTRACT

All work forming part of this Contract is divided into installations. The work to be performed as part of an installation under this Contract mainly consists of the following:

1. The various installations at the Port of Entry form part of the new Repair and Maintenance Programme.

2. No distinction will be made between prior to practical completion and completed installations for the purpose of maintenance.

3. The Contractor will have the opportunity at the start of the contract to point out items which are not in perfect working order which in turn will be repaired as per the relevant tendered repair rates.
4. The contractor will further more at the start of the contract perform annual maintenance on all the installations as specified in the BOQ, as part of the Contractor' maintenance obligation.

5. Maintenance will be the responsibility of the contractor and will be evaluated on a monthly basis by the Engineer. The remuneration for maintenance work and responsibilities will be certified accordingly

The Contractor will have the opportunity at the start of the contract to point out items which are not in a perfect working order by means of an assessment and verification report. Typically the following installations shall be assessed:

- Structural and Building related works
- Plumbing, drainage and wet services
- Fencing, cleaning and site keeping
- Bulk water and external water reticulation and water purification works
- Roads and stormwater drainage
- Building electrical
- External lighting
- Standby power generators
- Medium and low voltage equipment
- Heating, ventilation and air-conditioning systems
- Conventional fire fighting equipment

These items will be serviced and repaired as per the relevant tendered rates. The detail Assessment and Verification report shall provide an overview of problem areas at the beginning of the contract period. This shall include testing of all equipment as well as all civil, electrical and mechanical services. The detail Assessment and Verification report shall include photos with a description of problem areas. The Assessment and Verification report must be submitted one calendar month after site handover. A penalty of R 500 per day shall be imposed for late submission.

Payment for the Assessment and Verification report shall be included in the fixed preliminary and general charges.

PS 3.1 GENERAL ITEMS

- Compile and supply a complete site plan of PEKA AND MONANTSA LAND Ports of Entry Operational and Residential Areas
- Compliance with the Occupational Health and Safety Act and Construction Regulations 2003 and monthly audits.
- HIV / Aids Awareness campaigns and training including awareness workshops and awareness campaigns. Also included is the provision of condoms, posters, booklets, videos, etc. and monthly reporting.
- Site recordkeeping based on the maintenance control plan.
- Consumption monitoring (Electrical and Water)
- BCOCC Contingency infrastructure (provision of Easter and Christmas season facilities) and any peak season as identified by the client.
- Utilisation of a National Call Centre enabling the user departments to report breakdowns.
- Expanded Public Works Programme (EPWP): Implementation of labour intensive practices under the Expanded Public Works Programme (EPWP) **to a value of not less than 10% of the tendered contract amount for wages paid to local labour.**

PS 3.1.2 Repair and Servicing items in the contract includes:

- Building Structural Elements (Repair actions required to damages and deteriorated elements such as minor touch-up, painting to corroded elements and repair and realignment of locksets, doors, windows, gutters, roofs, etc.). Replacement of damaged floor coverings.
- Water-proofing of concrete roofs.
- Plumbing and Drainage (servicing of sanitary fittings, valves and taps, replacement of damaged/missing components)
- Electrical Installations (servicing of Distribution Boards, Luminaires, Light switches, socket outlets and geyser components as well as Bulk lamp replacement and statutory tests required). Issuing C.0.C's for all buildings.
- Fencing (clearing of fence route, retightening of fence elements, replacement of damaged fences and redressing existing fences)
- Refuse removal (removal of collected refuse from site to registered dumping site)
- Pest Control (Internal and External Termite and Rodent control and preventative measures)
- Water Distribution Networks (servicing and recalibration of water meters and valves, scouring of water pipelines, cleaning of manholes, cleaning of chambers as well as the sterilisation of water reservoirs and repair/service of water treatment package plant)
- Pumping equipment (servicing/reconditioning of water pumps) and reporting.
- Conformation to water standards (testing of water quality)
- Water Audit including compilation of database, meter management system and data loggers for essential services
- Statutory Registration of Water use & Blue Drop / Green Drop Requirements
- Roads (grading of gravel roads, replacement of washed-out jointing sand, repair of interlocking paving sections, repair to road markings and chemical control of vegetation, concrete repair). Installation of embankment-stabilisation Léffe/stein retaining blocks.
- Stormwater (repair of structures and cleaning of drainage channels, inlet- and outlet structures)
- External Electrical (servicing of external lighting luminaires, bulk lamp replacement, servicing of light poles, distribution kiosks and overhead distribution system). Replace damaged luminaires with new LED-type luminaires.
- Standby Power Generators (mandatory generator services as per the manufacturers specifications, testing, cleaning, and supply of diesel)
- Replacement of Generators, which has reached the end of serviceable lifetime.
- Air-Conditioning Units (full servicing of units, testing and cleaning of Air-Conditioning units). Replacement of out-dated units, which has reached the end of serviceable lifetime.

- Fire Fighting (statutory servicing, cleaning and recharging equipment as well as fire fighting training and a fire plan for each of the service buildings).

PS 3.1.3 Preventative Maintenance items in the contract includes:

The maintenance actions (Additional Specifications) of the following items as per specification SA: Maintenance and Servicing, to be measured monthly as per the performance indicators on the Maintenance Scorecards:

- Plumbing and Drainage
- Electrical Installations
- Fencing, Refuse Removal and Pest Control
- Cleaning and Site Keeping
- External Water and Sewer Networks
- Roads and Stormwater Drainage
- External lighting and Standby Power
- Heating, Ventilation and Air-Conditioning Systems
- Fire Fighting Equipment

PS 3.4 Periodic / Routine Maintenance tasks and Servicing in the contract includes:

- Log all water meter readings and calculate losses on a monthly basis and report in the prescribed format.
- Sample potable water supply and chemical analyses to be provided by an accredited laboratory on a monthly basis.
- Log all electricity meter readings on a monthly basis and report in the prescribed format,
- Monitoring of essential services
- Remove and empty waste from skip to external waste disposal site on a regular basis.
- De-sludge and cleaning of septic tanks on a regular basis as required.
- Service submersible pumps annually.
- Statutory annual servicing of fire extinguishers
- Pest and vermin control (internal and external)
- Providing diesel for standby generators for the duration of the contract to ensure that standby power is available at all times and mandatory periodical servicing of Standby Generators. Servicing generators every 200 running hours.
- Site keeping and cleaning of the Ports of Entry.
- Supply of potable drinking water in case of water shortages
- Cleaning of Administration Buildings and Public Ablutions on a daily basis.
- Supply of consumables for ablutions
- Annual servicing of all air-conditioning units.

Maintenance of each of the above installations will be the responsibility of the Contractor and will be evaluated on a monthly basis by the Engineer. The remuneration for maintenance work and responsibilities will be certified accordingly.

PS 3.2 DEPARTMENT OF WATER AFFAIRS INCENTIVE BASED REGULATION MANAGEMENT AND ADMINISTRATION

- Potable water quality tests to be performed by approved SANAS laboratory on a monthly basis on the water delivered to the consumers for determinants specified.
- Potable water quality tests to be performed by an approved SANAS laboratory on a monthly basis on the water abstracted from boreholes for determinants specified.
- Sewage effluent compliance quality tests to be performed by an approved SANAS laboratory for determinants specified.
- Raw sewage 24 h composite sample and analysis for determinants specified.
- Special testing required by the engineer shall include remuneration for all water and wastewater related analysis, in terms of either compliance monitoring, or required to determine risks. All operational sampling and monitoring shall be the Contractor's responsibility remunerated under Operation of an Installation.
- Full SANS 241 (Part 1) set of 34 x chemical, 8 x physical determinants and 6 x micro biological determinants for annual water quality risk assessment.
- Compile and submit to the Engineer for approval a Water Safety Plan in terms of the requirements of SANS 241 (Part 2), inclusive of risk based operational – and compliance monitoring programmes. Water demand management, including loss reduction and water use efficiency business plan Compile and submit to the Engineer for approval a Wastewater Risk Abatement Plan, inclusive of risk based operational – and compliance monitoring programmes, storm/ground water ingress monitoring and control planning.
- Operation as per Technical Specification DH09 comprising Maintain spreadsheet/database with drinking water system process control and maintenance information, including but not limited to: system input volumes, individual water consumption, system pressures, compliance results, operational process control results, chemical consumption, hour meter readings, volt meter readings, ammeter readings, breakdowns, etc., for PEKA AND MONANTSA LAND Ports of Entry, and submission to the Client in a format similar to the Department of Water Affair's incentive based regulation programmes.
- Operation as per Technical Specification EM04.08 comprising Maintain spreadsheet/database with wastewater treatment process control and maintenance information, including but not limited to: raw wastewater flow rates, effluent flow rates, irrigation rates, compliance results, operational process control results, chemical consumption, hour meter readings, volt meter readings, ammeter readings, breakdowns, etc., at PEKA AND MONANTSA LAND Ports of Entry, and submission to the client in a format similar to the Department of Water Affair's incentive based regulation programmes

PS 4 CONSTRUCTION PROGRAMME

When drawing up his construction programme, the Contractor shall take into account the time for completion for the repair work of each installation as indicated in Clause 42.1 as amended in Part 1 of the Contract Data.

- Repair Work – 06 months
- Maintenance Work – 36 months (Including repair work period)

If the programme submitted by the Contractor in terms of Clause 12 of the General Conditions of Contract, has to be revised because the Contractor is falling behind in his programme, he shall submit a revised programme of how he intends to regain lost time to ensure practical completion of repair work of each installation, and completion of the Works within the periods stipulated Part 1 of the Contract Data or within a granted extension of time and also to ensure that other contractors have access to the site to start their work on the dates as shown in the original programme. Proposals to increase the tempo of work must incorporate positive steps to increase production either by more labour and plant on the Site, or by using the available labour and plant in a more efficient manner.

Instructions by the Engineer to expedite progress shall not be the subject of additional compensation to the Contractor unless the instruction explicitly states that the Contractor is entitled to additional compensation and cites the amount of such compensation or the basis on which it is to be determined.

Failure on the part of the Contractor to submit or to work according to the programme or revised programmes shall be sufficient reason for the Engineer to take steps as set out in Clause 55 of the General Conditions of Contract as amended in Part 1 of the Contract Data.

The approval by the Engineer of a programme shall have no contractual significance other than that the Engineer will be satisfied if the work is carried out according to the programme. The said approval shall not limit the right of the Engineer to instruct the Contractor to vary the programme if necessary. The Contractor is also referred to Clause PS 8 and Clause PS 12 when preparing this programme.

NOTE:

NOTE: For reasons of limited access, it may not be possible to carry out the repair work on some of the installations in parallel with repair work on other installations. The repair work of some of the installations shall follow sequentially as indicated in the specifications.

The Contractor shall organise his work in such a manner as to cause the minimum inconvenience to the User Client's personnel and operations.

PS 5 SITE FACILITIES AVAILABLE

PS 5.1 CAMP SITE AND STORE ROOM

(a) Campsite

A site establishment area is available and will be indicated to the Contractor. An area for the campsite was developed by the previous contractor and the infrastructure and facilities can be utilised for the new contract but must be repaired and maintained during the contract to ensure that the facility maintains an esthetical value for the ports of Entry.

(b) Store Room

None of the existing service buildings may be used for storage. The contractor must provide his own store room facilities for the duration of the contract.

The existing and new facilities must comply with the South African National Building Regulations and Standards in all aspects.

PS 5.2 WATER, ELECTRICITY AND SEWERAGE

(a) Water supply

The Contractor must make his own arrangements for water supply. Water will be available at specific points not necessarily adjacent to working areas. Water will be available free of charge but wastage will not be tolerated. The Contractor must supply his own standard fittings to couple up at the points where water is available.

(b) Electrical power supply

Electrical power supply is available on the Site and will be free of charge. The Contractor must make his own arrangements for a connection to the electrical power supply. The Contractor will be responsible, at his own cost, for the distribution of electricity for construction and domestic use.

(c) Sewerage connection

Refer to Subclause PSA 4.2 in connection with toilet requirements. Chemical toilets shall be used.

Note: The Employer shall not be held responsible for any losses or inconvenience due to a disruption in the supply of water and/or electricity.

PS 5.3 PARKING FACILITIES

Parking facilities are available on site.

PS 6 SITE FACILITIES REQUIRED FOR THE ENGINEER

PS 6.1 GENERAL

The Contractor shall provide on the Site, for the duration of the repair phase and for the exclusive use of the Engineer and/or his Representative (as applicable), the various facilities described hereunder. The duration of the repair phase is stated in Part 1 of the Contract Data. All such facilities shall be provided promptly on the commencement of the Contract and failure on the part of the Contractor to provide any facility required in terms of this specification shall constitute grounds for the Engineer to withhold payment of the Contractor's Preliminary and General items until the facility has been provided or restored, as the case may be.

PS 6.2 OFFICE ACCOMMODATION

The Contractor shall provide on Site, 1(one) office for the exclusive use of the Engineer. Such office shall comply with and be furnished in accordance with the requirements of Subclause 3.2 of SABS 1200 AB. The Contractor shall maintain the offices in accordance with the requirements of Subclause 5.2 of SABS 1200 AB.

Irrespective the type of material of which an office is constructed, the Contractor shall ensure that the temperature inside the office is always between 20ºC and 24ºC.

Such office accommodation shall be provided within the Contractor's site establishment facilities.

PS 6.3 CARPORTS

The Contractor shall provide on Site 1 carport for the exclusive use of the Engineer, in accordance with requirements of Subclause PSAB 3.3 of the Project Specifications**.**

PS 6.4 SITE MEETING VENUE

The Contractor shall provide within its own site establishment facilities, a suitably furnished office or other venue capable of comfortably accommodating a minimum of six (6) persons at site meetings. The Engineer shall be allowed free use of such venue for conducting any other meetings concerning the Contract at all reasonable times.

PS 6.5 TELEPHONE AND COMPUTER FACILITIES

The Contractor shall, in accordance with the requirements of Subclause PSAB 4 of the Project Specifications provide one (1) Cellular phone and one (1) ZOGB/month (data—only) LTEl3G Wi-Fi-Router and one (1) computer for the duration of the contract for the use of the Engineer and his representative The average call cost at business rates (over the 36 month contract period) shall not exceed R 1,100-00 per month for the cellphone. 'Roaming' shall be activated on the cellular telephone as local cellular network reception is not available at all sites.

PS 6.7 CALL CENTRE

A call centre has been established by the Employer to log, route and monitor incoming breakdown calls.

The call centre is administered centrally and is responsible for the routing of breakdown calls on The Contractor shall be responsible for the fixed and variable call costs incurred by the call centre for a relevant contract. The Contractor shall be re-reimbursed from an amount included in the Bill of Quantities, on written instruction of the Engineer. Operating costs of the call centre will be calculated, based on the number of breakdowns logged per contract, and invoiced on a monthly basis.

The Contractor is entitled to a percentage of the value of each payment in relation to the call centre to cover his expenses in this regard (see payment item PSA 8.9).

PS 7 FEATURES REQUIRING SPECIAL ATTENTION

PS 7.1 INSTALLATIONS AT FACILITIES

The installations at all facilities shall be carefully checked for damage and all damages shall be listed and discussed with the Engineer before commencement of repair and maintenance work. The Contractor shall present copies of all correspondence in this regard for discussion at the following site meeting.

PS 7.2 SECURITY

(a) Restrictions on movement and limited access

The Contractor's personnel, vehicles and equipment will be restricted to areas of construction only. The Contractor shall comply with any requirements that the Engineer may have in this regard and shall take note that for security reasons the access to some areas, may be limited.

(b) Prohibition on taking of photographs

The Contractor's attention is drawn to the Defence Act, 1957 (Act No 44 of 1957) and the Correctional Services Act, 1998 (Act No 111 of 1998) which clearly state that the taking of photographs is prohibited and that even the possession of a camera on Site is an offence. Permission to take photographs of damaged equipment may be arranged by the Engineer.

(c) Security check on personnel

The Employer may require the Contractor to have his personnel or a certain number of them security-classified, if so required by any competent authority.

In the event of the Employer or any competent authority requiring the removal of a person or persons from the site for security reasons, the Contractor shall do so forthwith and the Contractor shall thereafter ensure that such person or persons are denied access to the site and/or to any documents or information relating to the work. In such circumstances the Contractor shall indemnify the Employer and the Engineer and shall hold the Employer and the Engineer harmless against any and all claims of whatever nature arising.

(d) Access cards to security areas

Should the work fall within a security area, the Contractor must obtain from the Engineer access cards for his security-cleared personnel and employees who work within such an area. The Contractor must comply with any regulations or instructions issued from time to time, concerning the safety of persons and property, by the Department of Correctional Services or SA Police services.

PS 7.3 SITE TO BE KEPT CLEAN

During progress of the work and upon completion thereof, the Site of the Works shall be kept and left in a clean and orderly condition. The Contractor shall store materials and equipment for which he is responsible in an orderly manner, and shall keep the Site free from debris and obstructions.

All redundant materials, rubbish and waste arising from the work must be removed from the Site at the Contractor's cost and the site and buildings left clean and tidy.

PS 7.4 FACILITIES TO OTHER CONTRACTORS

In addition to the requirements of Clause 18 of the General Conditions of Contract the Contractor must make allowances for other Contractors on the Site. This may involve adapting his programme to accommodate the work of other contractors and ensuring access to their sites along prescribed routes over the Site of this Contract.

PS 7.5 SUBCONTRACTORS

In addition to the requirements of Clause 6 of the General Conditions of Contract as amended in Part 1 of the Contract Data, the Contractor shall be responsible for work carried out by subcontractors on his behalf. The Engineer will not liaise directly with such subcontractors. Problems related to payments, programming, workmanship, etc., shall be the responsibility of the Contractor and the subcontractor, and the Engineer will not become involved.

PS 7.6 SABS SPECIFICATIONS AND CODES OF PRACTICE

All reference in this document to South African Bureau of Standards specifications and codes of practice, or any other standard specifications or codes of practice, including National Building Regulations, shall be deemed to be references to the latest issues of such specifications and codes.

PS 7.7 MATERIALS

The monthly payment for materials brought onto the Site will only be applicable for repair work and not for maintenance work.

Unless otherwise instructed in writing by the Engineer, all proprietary materials are to be used, mixed, applied, fixed, etc. strictly in accordance with the manufacturer's recommendations.

PS 7.8 BORROW PITS

There will be no designated borrow pits. The Contractor shall utilise the material on Site or import material from commercial sources.

PS 7.9 PROTECTION OF FURNITURE AND EQUIPMENT

Most of the work to be done inside buildings and occupied houses will be carried out in places where there is furniture and other equipment.

The Contractor shall be responsible for moving the furniture and equipment in order to provide working space for his personnel. The programme shall be drawn up in such a way as to keep the movement of furniture and equipment to the very minimum and the Contractor shall be solely responsible for any damage to furniture or equipment.

PS 7.10 TESTING AND QUALITY CONTROL

The Contractor shall engage the services of an approved independent laboratory or other institution as applicable for quality testing, to ensure that his work complies with the Specifications.

No separate payment will be made for such testing, the cost of which will be deemed to be included in the Contractor's rates bid for the items of work that require testing in accordance with the Specifications.

The onus to produce work that conforms in quality and accuracy of detail to the requirements of the Specifications and Drawings rests with the Contractor, and the Contractor shall, at his own expense, institute a quality-control system and provide experienced engineers, foremen, surveyors, materials technicians, other technicians and technical staff, together with all transport, instruments and equipment to ensure adequate supervision and positive control of the Works at all times.

The cost of supervision and process control, including testing carried out by the Contractor, will be deemed to be included in the rates bid for the related items of work.

The Contractor's attention is drawn to the provisions of the various Specifications regarding the minimum frequency of testing required. The Contractor shall, at his own discretion, increase this frequency where necessary to ensure adequate control.

On completion and submission of every part of the work to the Engineer for examination, the Contractor shall furnish the Engineer with the results of the relevant tests to indicate compliance with the Specifications.

PS 9 CERTIFICATES OF PAYMENT

The statement to be submitted by the Contractor in terms of Clause 49 of the General Conditions of Contract shall be prepared in accordance with the standard payment certificate prescribed by the Engineer and shall comprise at least two sets of A4-size paper copies.

All costs for the preparation and submission of the statements shall be borne by the Contractor.

PS 10 CONSTRUCTION IN RESTRICTED AREAS

Working space in certain areas may be restricted. The construction method used in these restricted areas largely depends on the Contractor's Plant. However, the Contractor must note that measurement and payment will be according to the specified cross-sections and dimensions irrespective of the method used, and that the rates and prices submitted will

be deemed to include full compensation for difficulties encountered while working in restricted areas. No extra payment nor any claim for payment due to these difficulties will be considered.

PS 10 DRAWINGS

The Contractor will, in terms of Clause 13 of the General Condition of Contract, be provided free of charge with three paper prints of each drawing issued to him.

All information in the possession of the Contractor that is required by the Engineer's representative to complete the as-built drawings must be submitted to the Engineer's representative before a Certificate of Completion will be issued.

Only figured dimensions shall be used and drawings shall not be scaled unless required by the Engineer. The Engineer will provide the dimensions that may have been omitted from the Drawings.

PS 11 LEGISLATION

(a) Changes in legislation

Reference in the General Conditions of Contract and in any other standard document forming part of this Contract to legislation which has been amended or superseded by other legislation since the most recent publication of such standard document, shall be deemed to be a reference to the amended or replacement legislation.

Such amended or replaced legislation shall be applicable during the Contract Period provided the amendment or replacement occurred more than 28 days before the closing date for bids in terms of Clause 46.4 of the General Conditions of Contract as amended in Part 1 of the Contract Data.

(b) The Occupational Health and Safety Act

The Contractor shall be required to comply with the Occupational Health and Safety Act, 1993: Construction Regulations, 2003 as promulgated in Government Gazette No 25207 and Regulation Gazette No 7721 of 18 July 2003. Non-compliance with these regulations, in any way whatsoever, will be adequate reason for suspending the Works.

The proposed type of work, materials to be used and hazards likely to be encountered on this Contract are detailed in the Scope of Work, Pricing Data and Drawings. The Employers' health and safety specifications (subclause 4(1)) of the regulations will be issued separately.

The Contractor shall in terms of subclause 5(1) provide a comprehensive health and safety plan detailing his proposed compliance with the regulations, for approval by the Employer. The Contractor shall at all times be responsible for full compliance with the approved plan as well as the Construction Regulations and no extension of time will be considered for delays due to non-compliance with the abovementioned plan or regulations.

A payment item is included in the Bill of Quantities to cover the Contractor's cost for compliance with the OHS Act and the abovementioned Construction Regulations 2003.

PS 12 INSURANCE AMOUNTS

The amounts for which the Contractor must insure the Works in terms of Clause 35 of Part 1 of the Contract Data are stated in the Agreement.

PS 13 TIMES FOR COMPLETION

Times for completion of repair work to installations as well as the maintenance down-time for different types of breakdowns are given under Clause 42.1 of Part 1 of the Contract Data. The time for completion will start on the date of access to an installation.

PS 14 PRACTICAL COMPLETION

(a) The Contractor shall be entitled in terms of Clause 51.1 of the General Conditions of Contract to receive a Certificate of Practical Completion when the Works to be executed under the Contract have been completed to the stage where:

(i) all materials which are required to be replaced have been replaced and installed to the satisfaction of the Engineer; and
(ii) all repair works have been completed.

(b) The Engineer shall issue to the Contractor and the Employer a Certificate of Completion in terms of Clause 51.4 of the General Conditions of Contract except where a thirty day commissioning period, as stated in paragraph (c) below, is applicable.

(c) Where indicated at the end of this paragraph, the issuing of a Certificate of Practical Completion for a certain installation will be followed by a thirty day commissioning period. The tasks of the Contractor during the thirty day commissioning period are described in Additional specification SC: General Decommissioning, Testing and Commissioning Procedures. After the completion of the thirty day commissioning period to the satisfaction of the Engineer, a certificate of completion will be issued to the Contractor as described in Clause 51.4 of the General Conditions of Contract.

PS 15 PENALTIES

Penalties in terms of Clause 43.1 of the General Conditions of Contract for late completion of repair work to different installations are given under Clause 43.1 of Part 1 of the Contract Data. Payment reductions for exceeding the maintenance down-time for different types of breakdowns are given under the applicable pay items in the Bill of Quantities for Additional specifications SA: General Maintenance. Penalties will run concurrently where applicable.

(a) Penalty for failing to meet undertakings and/or conditions pertaining to Targeted Procurement for the award of points

If the bid adjudication points awarded to the Contractor are found to be based on incorrect or false information or the conditions pertaining to the award of points are not met and the Contractor fails to substantiate that such failure is due to a reason acceptable to the Employer (as being) beyond the Contractor's control, the Contractor shall be liable for and pay to the Employer, and amount determined in accordance with

clause 2 and subject to clause 1 both of the Works Information, Part 2 of the Conditions of Bid.

(b) Payment reduction for non-performance

If the Contractor shall fail to rectify a fatal breakdown, an emergency maintenance breakdown, an ordinary maintenance breakdown and damage breakdown within the

time as stipulated in Additional Specifications SA: General Maintenance, the Contractor shall be liable to the Employer for the sum/sums stated in the Bill of Quantities for Additional Specification SA as a payment reduction for every hour/day down-time counting from the hour/day the breakdown was reported to the Contractor until the day it was repaired. These payment reductions will be cumulative and will run concurrently.

Where indicated above that the money will be recovered from the Contractor by means of payment reductions, the fixed negative amounts in the rate column of the Bill of Quantities will be used to reduce payments due to the Contractor.
The imposition of such payment reductions shall not relieve the Contractor from his obligation to complete the Works or from any of his obligations and liabilities under the Contract.

(c) Application of penalties to be accumulative

The imposition of all penalties in terms of this clause shall be accumulative and shall not relieve the Contractor from his obligation to complete the Works or from any of his obligations and liabilities under the Contract.

PS 19 NON-WORKING DAYS AND HOURS

Whenever any special non-working days stated in Clause 1.6 and Clause 38 of Part 1 of the Contract Data fall within the days allowed or stipulated in the Contract in terms of Clause 1.6 of Part 1 of the Contract Data, such special non-working days shall also be excluded from the calculation of the number of working days concerned.

The Contractor shall not work on any statutory public holidays or on any public holidays declared by the Government to be statutory non-working days, except for work related to repair fatal and emergency breakdowns which influences the functionality of any of the installations.

Working hours might be limited and the Contractor shall work in close cooperation with the User Client and Engineer in this regard. Working hours for the different installations are indicated at the end of this clause where applicable.

The Engineer shall be entitled at any time during the Contract, to vary the normal working hours specified in the Bid documents, including increasing or decreasing the total number of hours per day during which the Contractor may execute the Works or specific portions thereof.

If any variation by the Engineer of the normal working hours specified in the Bid Documents should result in an increase or a decrease in the total number of hours per week during which the Contractor is permitted to execute the Works or any particular portions of Works, then the time allowed in the Contract for the completion of the respective part of the Works

to which the varied normal working hours apply shall be adjusted proportionately in relation to:

a) the remaining time allowed for completion of the specific part or parts of the Works; and

b) the extent of the variation in the total normal working hours per week.

B AMENDMENTS TO THE STANDARD SPECIFICATIONS:

The following variations and additions to the SANS 1200 Standardised Specifications referred to in the last clause of Portion 1 apply to this Contract. The prefix PS indicates and amendment to SANS 1200. The letters and numbers following these prefixes respectively indicate the relevant Standardised Specification and clause number in SANS 1200.

PSA GENERAL

PSA 1 SCOPE

REPLACE SUBCLAUSE 1.1 WITH THE FOLLOWING:

"1.1 This specification covers requirements, principles and responsibilities of a general nature that are normally applicable to all Civil Engineering Contracts, as well as the requirements for the Contractor's establishment on the Site."

PSA 2 INTERPRETATIONS

PSA 2.3 DEFINITIONS

(a) General

ADD THE FOLLOWING DEFINITIONS:

"General conditions: The General Conditions of Contract specified for use with this Contract, and the Contract Data.

Specified: As specified in the standardised and standard specifications, the Drawings or the Scope of Work.

Permanent Works: as defined in Clause 1.1.17 of the General Conditions of Contract shall for the purpose of this Contract, be regarded as the repair work and maintenance work as defined in Subclause SA 02.06 of Additional Specification SA: General Maintenance."

(c) Measurement and payment

REPLACE THE DEFINITIONS FOR "fixed charge", "time-related charge" AND "value related charge" WITH THE FOLLOWING:

"Fixed charge: A charge that is not subject to adjustment on account of variation in the value of the Contract price or the Contract Time of Completion.

Time-related charge: A charge, the amount of which varies in accordance with the Time for Completion of the repair work, adjusted in accordance with the provisions of the Contract.

Value-related charge: A charge, the amount of which varies pro rata with the final value of the measured repair work executed and valued in accordance with the provisions of the Contract."

PSA 2.4 ABBREVIATIONS

(a) Abbreviations relating to standard documents

ADD THE FOLLOWING ABBREVIATION:

"CKS: SABS Co-ordinating Specification."

PSA 3 MATERIALS

PSA 3.1 QUALITY

ADD THE FOLLOWING:

"All manufactured materials supplied shall be new materials unless the contrary is specified. All materials specified in accordance with SABS Specifications shall bear the SABS mark, whether so specified or not."

ADD THE FOLLOWING SUBCLAUSE:

"PSA 3.3 ORDERING OF MATERIALS

The quantities set out in the Bill of Quantities have been carefully determined from calculations based on data available at the time and should therefore be considered to be approximate quantities only. Before ordering materials of any kind the Contractor shall check with the Engineer whether or not the scope of the work for which the materials are required is likely to change substantially. No liability or responsibility whatsoever shall be attached to the Employer for materials ordered by the Contractor except when ordered in accordance with written confirmation issued by the Engineer."

PSA 4 PLANT

PSA 4.2 CONTRACTOR'S OFFICES, STORES AND SERVICES

ADD THE FOLLOWING PARAGRAPH BEFORE THE FIRST PARAGRAPH:

"The Contractor's construction camp shall be fenced off and shall contain all offices, stores, workshops, testing laboratories, toilet facilities, etc. The camp shall always be kept in a neat and orderly condition.

No personnel may reside on the Site. No night-watchman may be on the Site after hours."

ADD THE FOLLOWING TO THE SECOND PARAGRAPH:

"One chemical toilet per 10 workmen shall be provided and must be screened from public view and its use shall be enforced.

The Contractor shall, where applicable, make the necessary arrangements for the removal of night soil."

PSA 5 CONSTRUCTION
PSA 5.4 PROTECTION OF OVERHEAD AND UNDERGROUND SERVICES

REPLACE THE HEADING AND THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"PSA 5.4 LOCATION AND PROTECTION OF EXISTING SERVICES

PSA 5.4.1 Location of existing services

Before underground or excavation work is carried out, the Contractor shall ascertain the presence and position of all services likely to be damaged or interfered with by his activities. He shall obtain up-to-date plans from the Engineer for this purpose, showing the position of services in the area where he intends to work. As services can often not be reliably located from such plans, the Contractor shall determine the exact position of such services by means of suitable detecting equipment and afterwards by careful hand excavation where necessary in order to expose the services at the positions of possible interference by his activities. This procedure shall also be followed in respect of services not shown on the plans but believed to be present.

All such services, the positions of which have been located at the critical points, shall be designated as 'known' services and their positions shall be indicated on a separate set of Drawings, a copy of which shall be furnished to the Engineer.

While he is occupying the Site, the Contractor shall be liable for all damage caused by him to known services as well as for consequential damage, whether caused directly by his operations or by the lack of proper protection.

PSA 5.4.2 Protection during repair and maintenance work

The Contractor shall exercise all the necessary care to prevent damage to known services during repair and maintenance work. Where applicable, major excavating equipment and other Plant shall not be operated dangerously close to these services. Where necessary, excavation in close proximity to these services shall be carefully carried out with suitable hand tools, excluding picks wherever their use could damage the services. No additional payment will apply to such more difficult work.
Services left exposed shall be suitably protected from damage.

PSA 5.4.3 Alterations and repairs to existing services

Unless the contrary is clearly specified or ordered, the Contractor shall not carry out alterations to existing services. When this is necessary, the Contractor shall inform the Engineer, who will either make arrangements for such work to be executed by the owner of the service, or instruct the Contractor to make such arrangements himself.

When existing services are damaged by the Contractor, he shall immediately inform the Engineer, or when this is not possible, the relevant authority, and obtain instructions as to who should carry out repairs. In urgent cases the Contractor shall take the necessary steps to minimise damage to and interruption of the service. No repairs of telecommunication cables or electric power lines and cables shall be attempted.

The Employer will accept no liability for damages due to a delay in having such alterations or repairs effected. The Contractor shall provide all reasonable opportunity, access and assistance to persons carrying out alterations or repairs of existing services."

ADD THE FOLLOWING SUBCLAUSE:

"PSA 5.9 SITE MEETINGS

The Contractor will be required to attend regular site meetings, normally held once a month to discuss general progress, quality of work, problems, claims, payments, etc., but not matters concerning the day-to-day running of the Contract."

PSA 6 TOLERANCES

ADD THE FOLLOWING SUBCLAUSE:

"PSA 6.4 GENERAL

No guarantee is given that the full specified tolerances will be available independently of each other, and the Contractor is cautioned that the liberal or full use of any one or more of the tolerances may deprive him of the full or any use of tolerances relating to other aspects of the work.

Except where the contrary is specified or when clearly not applicable, all quantities for measurement and payment shall be determined from the 'authorised' dimensions. These are specified dimensions or those shown on the Drawings or, if changed, as finally prescribed by the Engineer, without any allowance for the specified tolerances. Except if otherwise specified, all measurements for determining quantities for payment will be based on the 'authorised' dimensions.

If the work is therefore constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, quantities will be based on the 'authorised' dimensions regardless of the actual dimensions to which the work has been constructed.

When the work is not constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, the Engineer may nevertheless, at his sole discretion, accept the work for payment. In such cases no payment shall be made for quantities of work or material in excess of those calculated for the 'authorised' dimensions, and where the actual dimensions are less than the 'authorised' dimensions minus the tolerance allowed, quantities for payment shall be based on the actual dimensions as constructed."

PSA 8 MEASUREMENT AND PAYMENT

PSA 8.1 MEASUREMENT

PSA 8.1.2 Preliminary and general items or section (for repair phase only)

PSA 8.1.2.2 Bid sums

REPLACE THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"The Contractor's bid sums under items PSA 8.3 and PSA 8.4 shall collectively cover all charges during the repair phase for

- risks, costs and obligations in terms of the General Conditions of Contract, the Contract Data and of this Standardised Specification, except where provision is made in these Project Specifications to cover compensation for any of these items;

- head-office and site overheads and supervision;

- profit and financing costs;

- expenses of a general nature not specifically related to any item or items of permanent or temporary work;
- providing facilities on Site for the Contractor's personnel, including offices, storage facilities, workshops, ablutions, for providing services such as water, electricity, sewerage, sewage and rubbish disposal, for access roads and all other facilities required, as well as for the maintenance and removal on completion of the Works of these facilities and the cleaning-up of the camp site on completion of the Works;

- providing facilities for the Engineer and his staff as specified in SABS 1200 AB and in these Project Specifications"

PSA 8.2 PAYMENT

PSA 8.2.1 Fixed-charge and value-related items

REPLACE THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"Payment of fixed charges in respect of item 8.3.1 will be made as follows:

Eighty per cent (80%) of the sum bid will be paid when the facilities have been provided and approved. The remaining 20% will be paid when the repair works have been completed, the facilities have been removed and the camp site has been cleared and cleaned.

Payment for the sum bid under item 8.3.2 will be made in three separate instalments as follows:

(a) The first instalment, which is 40% of the sum, will be paid when the Contractor has fulfilled all his obligations to date under this Standardised Specification, the General Conditions of Contract and the Contract Data, and when the value of work certified for payment, excluding materials on Site and payments for preliminary and general items, is equal to not less than 5% of the total value of the repair work listed in the Bills of Quantities.

(b) The second instalment, which is 40% of the sum, will be made when the amount certified for payment, including retention monies but excluding this second instalment, exceeds 50% of the repair work.

(c) The final payment, which is 20% of the sum, will be made when the repair works have been certified as completed and the Contractor has fulfilled all his obligations to date

under this Standardised Specification, the General Conditions of Contract and the Contract Data.

Should the value of the measured repair work finally completed be more or less than the Bid Sum for repair work, the sum bid under item 8.3.2 will be adjusted up or down in accordance with the provisions of Clause 50 of the General Conditions of Contract as amended in Part 1 of the Contract Data, and this adjustment will be applied to the third instalment. No adjustment will apply to item 8.3.1 in respect of variations in the value of work done or after the finally authorised Time for Completion."

Note: Payment under item 8.3.2 will only be applicable to repair work.

PSA 8.2.2 Time-related items

REPLACE THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"Subject to the provisions of Subclauses 8.2.3 and 8.2.4, payment under item 8.4.1 (time-related item) will be made monthly in equal amounts for each installation, calculated by dividing the sum bid for the item by the repair phase period for the installation in months, provided always that the total of the monthly amounts so paid for the item is not out of proportion with the progress of the work on the installation as a whole.
Should the Engineer grant an extension of Time for Completion of the repair works on the installation, the Contractor will be entitled to an increase in the sum bid for the time- related item, which increase shall be in the same proportion to the original sum bid as the extension of time is to the original Time for Completion of the repair works.

Payment of such increased amounts will be deemed full compensation for all additional time-related preliminary and general costs due to the circumstances pertaining to the extension of time granted for an installation. The length of the repair phase for each installation is indicated in Part 1 of the Contract Data.

In the Bills of Quantities separate provision is made for time-related items for each installation individually. Time-related payment for an installation shall only be made when the repair work on the installation is in progress and shall end when the time for completion or an extension of time granted by the Engineer expires. When repair work on more than one installation is in progress, time-related payment will be made for each installation and the conditions as stated above shall apply to each installation individually."

PSA 8.3 BILLED FIXED-CHARGE AND VALUE-RELATED ITEMS

REPLACE THE ITEMS WITH THE FOLLOWING:

"PSA 8.3.1 Fixed preliminary and general charges Unit : Sum

PSA 8.3.2 Value-related preliminary and general charges Unit : Sum

The bid sums shall include full compensation for all fixed and value-related preliminary and general charges as described in Subclause PSA 8.1.2.2. Payment will be made as described in Subclause PSA 8.2.1."

PSA 8.4 BILLED TIME-RELATED ITEMS

REPLACE THIS ITEM WITH THE FOLLOWING:

PSA 8.3.2 Time-related preliminary and general charges Unit : Month

(a) PEKA AND MONANTSA LAND Ports of Entry

The bid sums shall include full compensation for all time-related preliminary and general charges as described in Subclause PSA 8.1.2.2. Payment will be made as described in Subclause PSA 8.2.2

Note: The total amount bid for items PSA 8.3.1, PSA 8.3.2 and PSA 8.4.1 shall not exceed 15% of the total amount for repair work, excluding value- added tax.

PSA 8.8 TEMPORARY WORKS

REPLACE ITEM 8.8.4 WITH THE FOLLOWING:

PSA 8.8.4 Location and protection of existing services:

PSA 8.8.4.1 Provision of detecting devices for:

(a) Water and sewer pipes

(b) Electrical and other cables

The bid sums shall cover the cost of providing and operating suitable equipment for as long as it is needed to locate all the existing services likely to be affected by the construction activities. Alternatively, an approved specialist firm may be employed to carry out the work.

PSA 8.8.4.2 Hand excavation necessary for locating and exposing existing services in all material:

(a) In roadways Unit:m3

(b) In all other areas Unit:m3

The rates shall cover the cost of excavation by means of hand tools within authorised dimensions, for all precautionary measures to protect the services from damage during excavation and backfilling, and for subsequent backfilling and compacting. Compaction of material in all areas except in roadways shall be to 90% of the modified AASTHO density.

The rate for hand excavation in roadways shall include compensation for compacting excavated or selected backfill materials to 93% modified AASTHO density.

The tendered rates shall also include for keeping excavations safe, for dealing with surface and subsurface water, for removing surplus excavated material from Site, for transporting all material, and for supplying adequate supervision during both excavation and backfilling operations.

PSA 8.9 ADDITIONAL TESTS:

(a) Additional tests required by the Engineer Unit : Sum

(b) Attendance and profit Unit : %

An amount has been allowed in the Bill of Quantities under sub item (a) to cover the cost of additional tests required by the Engineer. The Engineer will have the sole authority to spend the amount or part thereof.

The bid percentage under sub item (b) will be paid to the Contractor on the value of each payment made to the testing authority.

Note in connection with sub item (a):

The Contractor is responsible for both the cost of normal testing as described in Subclause PS 8.10 in portion 1 of the Project Specifications and for the cost of any additional test that indicates that the Specifications have not been complied with.

PSA 8.10 SECTIONAL FENCING FOR THE PROTECTION OF THE WORKFORCE Unit : m

The bid rate shall include full compensation for the supply, delivery, initial erection and finally removal from the site of the sectional fencing. The cost to move the fencing will not be paid for separately but shall be deemed to be included in the rate bid.

PSA 8.11 MAINTENANCE MATERIAL:

Supply and deliver maintenance material to the site:

(a) Description of type of service for which material is needed:

(i) Description of specific material Unit: litre, m², m, number (ii) Etc. for other types of material.

(b) Etc. for other types of service.

The unit of measurement shall be the litre, square metre, metre or number as applicable to each item ordered on the written instructions of the Engineer.

The bid rates shall include full compensation for supplying and delivering to the maintenance store(s) of the Employer on the Site of the Works each item as billed and shall include for all labour, material, waste and, transport.

A complete book keeping system with delivery notes and order "invoices" shall be kept by the Contractor and the cost thereof shall be deemed to be included in the rates bid for the various items.

The rates bid will be fixed for the full duration of the repair and maintenance phases and shall be applicable to any quantity "ordered" irrespective of size, contents, volume of container or the number. The actual square metre size of the "ordered" items will be calculated to two decimal points for payment purposes. No "rounding-off" to the nearest square metre quantity will be allowed. It is expected that the maintenance material will be ordered in small quantities throughout the duration of the Contract."

PSA 8.12 COMPLIANCE WITH OHS ACT AND CONSTRUCTION REGULATIONS 2003

Unit: sum

The bid sum shall include full compensation to the Contractor for compliance with all the requirements of the OHS Act and the Construction Regulations 2003 at all times during the repair and maintenance phase, as described in PS 13 of Portion 1 of the Project Specifications. The successful bidder shall provide the Engineer with a complete breakdown of this bid sum.

This sum will be paid to the Contractor in equal monthly amounts for the entire duration of the contract period.

PSAB ENGINEER'S OFFICE

PSAB 3 MATERIALS

PSAB 3.1 NAMEBOARDS

REPLACE THE FIRST SENTENCE OF SUB-CLAUSE 3.1 OF SABS 1200AB WITH THE FOLLOWING:

"The Contractor shall supply and erect at locations approved by the Engineer, the number of contract nameboards specified in the Project Specifications, which, unless otherwise specified in the Contract, shall comply with the recommendations for the standard board of the South African Association of Consulting Engineers, with regards to size, painting, decorating and detail, and the requirements described hereunder."

PSAB 3.2 OFFICE BUILDING(S)

REPLACE THE WORDS: "as scheduled" IN PARENTHESIS IN THE FIRST LINE OF SUBCLAUSE 3.2 OF SABS 1200 AB WITH: "as specified in Portion 1 of the Project Specifications";

AND REPLACE SUBCLAUSE 3.2(j) OF SABS 1200 AB WITH THE FOLLOWING:

"(j) a heater and fan / air-conditioning unit both of such capacity that the inside of the office(s) is always at a temperature of between 20ºC and 24ºC."

ADD THE FOLLOWING SUBCLAUSE IN CLAUSE 3:

"PSAB 3.3 CAR-PORT

The Contractor shall construct the number of carports indicated in Portion 1 of the Project Specifications, for the sole use of the Engineer and his staff. Each car-port shall be constructed so that the vehicle parked under it is always protected against the direct rays of the sun. The carport area shall be at least 20 m2 and the floor shall be covered with a layer of crushed stone to alleviate dusty and muddy conditions. The carport(s) shall be positioned so as to provide easy and convenient access to the Engineer's office."

PSAB 4 PLANT

PSAB 4.1 TELEPHONE

REPLACE THE WORDS: "Department of Post and Telecommunications" WITH "Telkom" AND ADD THE FOLLOWING AT THE END OF SUBCLAUSE 4.1 OF SABS 1200 AB:

"In addition to a Telkom telephone and subject to satisfactory transmission and reception quality in the vicinity of the Site, the Contractor shall provide the number of cellular telephones and associated service contracts from a reputable cellular service provider, as specified in the Project Specifications, for the exclusive use of the Engineer and his staff."

ADD THE FOLLOWING NEW SUBCLAUSES TO CLAUSE 4 OF SABS 1200 AB:

PSAB 4.3 TELEFAX FACILITIES

No telefax facilities required.

PSAB 4.4 SURVEY EQUIPMENT

No survey equipment is required.

PSAB 5 CONSTRUCTION

PSAB 5.4 TELEPHONE

REPLACE THE CONTENTS OF SUBCLAUSE 5.4 OF SABS 1200 AB WITH THE FOLLOWING:

"PSAB 5.4.1 Telkom telephones

The Contractor shall advise Telkom promptly of any faults which develop in the telephone service and shall, in such circumstances, arrange for the earliest possible restoration of the said service.
The Contractor shall ensure that the telephone account is promptly paid.

PSAB 5.4.2 Cellular telephones

The Contractor shall advise the cellular service provider of any faults which develop in the cellular telephone service and/or the cellular telephone handsets and shall, in such circumstances , arrange for the earliest possible restoration of the said service.

The costs of any necessary repairs and/or the replacement of components to the handsets of the cellar telephones shall be for the Contractor's account.

The Contractor shall ensure that all accounts for cellular phone calls and the respective service contracts are promptly paid."

ADD THE FOLLOWING NEW SUBCLAUSES TO CLAUSE 5 OF SABS 1200 SB:

PSAB 5.7 TELEFAX FACILITIES

No telefax facilities required.

PSAB 5.8 SURVEY EQUIPMENT

No survey equipment is required.

MONANTSA PASS AND PEKA BRIDGE PORTS OF ENTRY: REPAIR, MAINTENANCE AND SERVICING OF BUILDINGS, CIVIL, ELECTRICAL AND MECHANICAL INFRASTRUCTURE AND INSTALLATIONS (36 MONTHS)

PART C3.2:

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATION

A PLUMBING AND DRAINAGE INSTALLATIONS

CONTENTS

A 01 SCOPE

This specification covers the general servicing and maintenance of plumbing and drainage installations, which include the following:

(a) Rainwater disposal systems
(b) Soil and wastewater drainage systems
(c) Domestic water distribution and reticulation systems
(d) Sanitary and brassware equipment

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

The Ports of Entry consists of various facilities, as listed in specification **SS: Site Specific Inventory**, which form part of the maintenance and servicing contract for the plumbing and drainage installation.

A 02 STANDARD SPECIFICATIONS

A 02.01 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 deemed to form part thereof:

A 02.01.01 SANS Specifications and codes

SANS 10254	-	The installation, maintenance, replacement and repair of fixed electric storage water heating systems
SANS 10400	-	The application of the National Building Regulations
SANS 1200 DB	-	Earthworks (pipe trenches)
SANS 1200 LB	-	Bedding (pipes)
SANS 1200 L	-	Medium-pressure pipelines
SANS 10252. Part 1	-	Water supply installations for buildings
SANS 10252. Part 2	-	Drainage installations for buildings

SANS Specifications listed on page 3 of the DPW Specification PW 371

A 02.01.02 Department of Public Works Specifications

PW 371 - Specification of materials and methods to be used. (Fourth revision, October 1993)

A 02.01.03 **Occupational Health and Safety Act of 2003**

All regulations and statutory requirements as laid down in the latest edition of the Occupational Health and Safety Act, 1993: Construction Regulations, 2003 as promulgated in Government Gazette No 25207 and Regulation Gazette No 7721 of 18 July 2003 shall be adhered to.

A 02.01.04 **Manufacturers' specifications, codes of practice and installation instructions**

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

A 02.01.05 **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.

A 03 GENERAL SERVICING AND MAINTENANCE

The following additional general specifications and requirements shall be read in conjunction with this specification and shall be adhered to unless otherwise specified in the Particular Specification.

A 03.01 GENERAL SERVICING AND INSTALLATION REQUIREMENTS

(a) All materials and equipment supplied and installed shall be new, high quality and designed and manufactured to the relevant specifications and suitable for providing efficient, reliable and trouble-free service.

(b) All work shall be executed in a workman-like manner by ***qualified registered plumbers.***

(c) All equipment, component parts, fittings and materials supplied and/or installed, shall conform in respect of quality, manufacture, test and performance to the requirements of the applicable current SANS specifications and codes, except where otherwise specified or approved by the Engineer in writing.

(d) All materials and workmanship which, in the opinion of the Engineer, are inferior to that specified for the work will be condemned. All condemned material and workmanship shall be replaced or rectified as directed and approved by the Engineer.

(e) The Contractor shall submit a detailed list of the equipment and material to be used to the Engineer for approval *before* placing orders or commencing installation.

(f) All new piping shall be installed and positioned so as not to impede on access routes, entrances and other services. The Contractor shall coordinate these new pipe routes taking other services and equipment into account.

(g) All control equipment and serviceable items shall be installed and positioned so that they will be easily accessible and maintainable.

(h) The Contractor shall make sure that all safety regulations and measures are applied and enforced during the servicing and maintenance work to ensure the safety of the public and the User Client.

(i) Servicing (Corrective maintenance) and preventative maintenance work shall be programmed in such a manner as to ensure the shortest possible downtime of any service and the least inconvenience to the User Client and the public. The Contractor shall make sure that the necessary notifications and notices are timeously put into place for these activities.

A 03.02 **GENERAL REQUIREMENTS FOR SERVICING AND INSTALLATION OF DOMESTIC WATER INSTALLATIONS**

(a) All pipes are to be carefully examined for defects and flaws before installation and shall be neatly fitted. They shall be installed in such manner as to prevent the formation of air locks. Automatic air vents shall be installed on all high points of the installation.

(b) The ends of all the pipes are to be clean, free from burrs, and rough edges, and joined together tightly. Where applicable such as with galvanised piping, an approved pipe jointing compound may be sparingly used with best quality hemp. All surplus or exposed hemp is to be thoroughly cleaned off joints before the painting of pipes. Pipes to be installed underground shall comply with the requirements of SANS 1200L and SANS 1200LB as far as bedding, excavation and backfilling are concerned.

(c) All vertical pipes must be securely fixed with brackets and supports of approved type, into the wall and not more than 40 mm from the wall. These fixings must be strictly adhered to.

(d) Pipes installed in service ducts and ceiling voids are to be perfectly plumbed and secured with approved brackets, fixed securely at distances not exceeding the specified distances and not more than 40 mm away from the face of the walls or soffits. Pipes must be free to move in the brackets. Pipes inside buildings and where specified shall be chased into walls, wrapped with building paper and properly secured and covered. Pipes must be free to move in the brackets.

(e) Pipes passing through walls and concrete floors are to be provided with suitable pipe sleeves extending 10 mm beyond finished floor or wall surfaces. All pipe fixings and throughways shall be free to allow movement for expansion and contraction. Any pipe fitting used to join a pipe which is rigidly secured by a structural element shall be securely anchored to prevent any stress developing between the fitting and the structural element.

(f) Chromium or nickel-plated metal covering plates are to be provided and fixed securely to pipes passing through the ceilings and walls. This requirement is not applicable to concrete floors and ceilings.

(g) Pipes passing through the ceilings or floors shall be offset from the wall to the front of the cornice with sufficient clearance to allow for the clear fixing of a ceiling plate. Pipes shall not be installed directly through the cornice. In multi-storey buildings where wall thickness varies, the same shall apply.

(h) All offsets are to be evenly and symmetrically set, the offsets being as near to the ceiling as possible.

(i) Pipes shall be installed in such a manner to allow for contraction and expansion.

(j) During construction all pipe ends shall be kept plugged to prevent any ingress of dirt, rubble, etc.

(k) Damages, chases, holes, etc, in brickwork, concrete and other finishes resulting from replacement and service work shall be made good to match the existing and shall include plaster, concrete work, brickwork, paint, tiling, ceilings and all required materials for the remedial action.

(l) The work shall be of a high quality and executed by qualified tradesmen in accordance with the relevant specifications.

A 03.03 GENERAL REQUIREMENTS FOR SERVICING AND INSTALLATION OF SOIL AND WASTEWATER INSTALLATIONS

The following requirements shall apply to this installation unless otherwise specified.

A 03.03.01 Underground sanitary drainage installations

(a) All manhole covers and frames shall be cast into the concrete cover slabs.

(b) Manholes in trafficable areas shall be provided with type 1A heavy-duty cover and frame and surrounded by concrete slabs.

(c) Fittings in the ground and below floor slabs shall be without access eyes.

(d) Sewer pipes in the ground with a slope *steeper* than 1:5 and/or under surface beds shall be encased in concrete as detailed.

(e) The sewer outside the boundary of a building complex shall be constructed strictly in accordance with the details and specifications of the local authorities.

(f) Existing drainage invert levels and positions are to be checked against invert levels given on the drawings before commencing the work. The Contractor shall inform the Engineer immediately of any discrepancy.

(g) All affected existing services are to be located and exposed before commencing the proposed servicing and maintenance work.

(h) The drainage system shall be tested according to the specifications laid down by the NBRI. This shall be carried out in the presence and to the satisfaction and approval of the Engineer.

(i) During construction all pipe ends are to be suitably plugged to prevent any ingress of dirt, rubble, etc.

(j) Any drainage pipe within the 45° range below building foundations shall be encased in concrete or soilcrete as specified.

A 03.03.02 Above ground sanitary drainage installations

(a) All accessible waste and soil fittings above ground level shall have inspection eyes. Inspection eyes shall not be underneath any fittings.

(b) All single wash hand basins shall be connected to a 40 mm internal diameter waste pipe.

(c) All groups of wash hand basins and sinks shall be connected to a 50 mm internal diameter waste pipe, unless otherwise indicated.

(d) All traps up to and including 50 mm diameter shall be of the "deep reseal" (75 mm) type.

(e) The maximum bend on any single fitting shall be 45°, with the exception of ventilation pipes where bends of up to 90° may be used.

(f) Drainage pipes and fittings running below concrete slabs and along walls and columns shall be suspended by means of approved type hangers, holderbats, etc, placed at appropriate intervals, to provide a rigid, proper suspended system as required by the manufacturer.

(g) All ventilation pipes shall be finished off with a suitable durable grating.

(h) All S-trap WC pans shall have plugged anti-siphon horns fitted to provide for cleaning access.

A 03.04 PRESSURE TESTING OF WATER PIPES

(a) All new pipe installations shall be pressure tested before being taken into use. The Engineer shall witness this pressure test. Tests shall be carried out both on surface-mounted and buried pipework. Buried pipes shall be backfilled except at fittings and joints before being tested.

(b) Completed sections of the pipe installation shall be filled with water after all branches have been plugged, sealed or closed.

(c) The section of pipe shall be hydraulically pressure tested by means of a suitable manually-operated or mechanically-driven pressure pump.

(d) A pressure of at least 1,5 times the working pressure of the class rating of pipes or fittings shall be applied for a period of time specified in the specifications or as recommended by the manufacturers. (Refer to SANS 1200 L for minimum and maximum test pressures.)

(e) Tests shall not be performed against closed valves.

(f) Leakage which occurs shall be measured and calculated and checked against the allowable losses, as specified in SANS 1200 L.

(g) If the completed section of pipe complies with all specifications and passes the tests and inspection, to the approval of the Engineer, and the Contractor shall backfill the open sections of trench at the joints and connections, where applicable.

(h) The Contractor shall then proceed to build all the valve chambers, inspection chambers, etc, for underground installations and shall close-off around pipes in walls, voids and ducts for above ground installations.

A 03.05 STERILISING OF WATER PIPES

(a) Before any pipeline is taken into use, the pipeline shall be sterilised over its complete length, including the fittings. The pipe shall be filled with potable water chlorinated to a concentration of 15 mg of chlorine per litre of water, which shall remain in contact with the inner surface of the pipeline for a period of not less than 24 hours. The pipeline shall be filled for sterilising in such a manner that no water-hammer shock is created or air is trapped in the pipeline.

(b) The Contractor shall submit full details of the proposed method of sterilising the pipeline to the Engineer for approval at least fourteen days prior to the commencement of sterilising.

(c) The cost of water for filling the pipeline for sterilising shall be borne by the Contractor.

(d) The Contractor shall provide all necessary materials, tools, equipment and labour required for sterilising the pipeline. After sterilising the pipeline the Contractor shall, at no extra cost, empty the pipeline and dispose of the water in a manner approved by the Engineer.

The Contractor may use the following products as a source of chlorine:

- chloride of lime to SANS 295 yielding 33 % free chlorine by mass;
- calcium hypochlorite to SANS 295 yielding 70 % free chlorine by mass;
- chlorine gas applied by chlorinator.

After sterilisation, an approved water quality test shall be carried out to a minimum number of 10 % of the total water points, randomly selected, evenly spread and marked on drawings. These tests shall include a full bacteriological test as per SANS 241 and the results shall be submitted to the Engineer for approval. All tests shall be for the Contractor's account.

A 03.06 AIR TEST FOR SEWER AND DRAINS

The following air test requirements are specified in the NBRI information sheet X/BOU 2-34 and are reproduced here. They shall be applicable to all air tests on new sewers and drains installed, and shall be executed by the Contractor and witnessed by the Engineer.

A 03.06.01 Method of air testing

All openings in the pipeline are plugged by means of sewer testing plugs. The sewer plug at the lowest end of the pipeline is connected to an air supply hose, which is attached to a mechanically driven air blower, compressor or hand pump. Air is pumped into the pipeline at a pressure of approximately 375 mm water gauge. The pressure is held at this level for a period of two minutes to allow the air temperature to become constant. Subsequently the air supply is closed off and the time recorded for the air pressure to drop from 250 to 125 mm water gauge. If the recorded time is less than the value given in table AA 03.06.01/1 below, it means that the pipeline leaks and does not comply with the required standards of tightness. The apparatus required for the air test is commercially available.

The following requirements have to be taken into account when performing the air test:

(a) Air-permeable pipelines such as vitrified clay or asbestos cement should preferably be tested when moist or wet.

(b) The trench should be partially backfilled before the test is carried out. This is to stop possible temperature variations and to prevent damage to the pipeline during subsequent backfilling operations.

(c) The testing equipment should be shielded from the direct rays of the sun.

(d) Flexible joints are recommended for sewer and drain pipelines. Good quality flexible joints are superior to cement caulked joints and they also

provide the pipeline with flexibility to prevent cracking due to subsequent soil movement.

(e) The test method is very sensitive to flaws in the pipeline, such as cracks or leaking joints. The actual positions of flaws along the pipeline can be determined by using special equipment.

(f) If the pipeline is below the water table and subjected to external water pressure, the test method should be modified so that the final pressure value are higher than that of the external water pressure acting on the lowest part of the pipeline.

TABLE AA 03.06.01/1: MINIMUM TIMES FOR PRESSURE DROP OF 250 mm TO 125 mm WATER GAUGE

PIPE (DIAMETER (mm)	MINIMUM TIME (min - s)	CRITICAL LENGTH OF PIPELINE (m) (58 m^2 INTERNAL SURFACE AREA)	MINIMUM TIME (S) FOR LONGER LENGTH (L) OF PIPELINE
100	1 - 58	184,6	0,640 L
150	2 - 57	123,1	1,439 L
200	3 - 56	92,3	2,559 L
225	4 - 26	82,1	3,239 L
250	4 - 55	73,8	3,998 L
300	5 - 54	61,5	5,757 L
375	7 - 23	49,2	8,996 L
450	8 - 51	41,0	12,954 L
525	10 - 20	35,2	17,632 L
600	11 - 49	30,8	23,030 L

A 04 DETAILS OF SERVICING WORK TO INSTALLATIONS, SYSTEMS AND EQUIPMENT

A 04.01 GENERAL

During the contract all the systems, installations and equipment shall be serviced as specified in the Specification and work instructions. This work shall include but not be limited to the specified Specification details.

All work shall be executed using approved materials and equipment suitable to the systems and/or installations they serve.

All materials and equipment shall comply fully with the requirements as specified for each installation.

The said work shall be executed in accordance with the relevant codes of practice, standards, regulations, municipal laws and by-laws, manufacturer's specifications and codes of practice and all additional and particular specifications included in this document.

A 04.02 RAINWATER DISPOSAL SYSTEMS

A 04.02.01 General

Servicing work to the rainwater disposal system shall include but not be limited to the following:

(a) Replacement of damaged, broken, leaking and corroded pipework and fittings;

(b) Replacement of damaged, broken and missing rainwater outlets, stormwater catch pit gratings, manhole covers and frames and floor drains;

(c) Work to damaged manholes, catch pits, curb inlets, channel drains and drain points including builder's work and benching;

(d) Initial unblocking and clearing of all rainwater drainage pipes, manholes, catch pits, drain points, channel drains and gutters;

(e) Servicing of drainage system where necessary;

(f) Provision of additional rainwater drainage points where outlets are insufficient and ponding occurs;

(g) Prevention of the ingress of any unauthorised effluent into this drainage system;

(h) Realign and fix gutters to correct falls where necessary, including additional brackets where required.

(i) Reinstatement and making good of walls, tiling, floors, concrete, road surfaces, etc, to approved acceptable levels where any service work has been executed;

A 04.02.02 Material and equipment specification for rainwater disposal systems

Materials and equipment to be used for servicing items shall be suitable and/or adaptable to the existing installation and shall comply with the following:

(a) uPVC pipe and fittings above ground

uPVC pipes and fittings shall be used for above ground installations.

For pipe sizes larger than 160 mm diameter uPVC class 6 pressure pipe to SANS 966-1 shall be used with prefabricated uPVC bends and junctions. Prefabrication shall be done by means of hot-air welding of fittings to be covered with three layers of fibreglass reinforced lining over welded sections. The resin to be used shall be as specified by the manufacturer for usage with PVC. Bends shall be manufactured out of 3 to 4 sections per bend. Pipe jointing shall be done by means of couplings fixed with solvent cement for PVC piping. This joint shall be reinforced with a fibreglass lining of three layers.

Piping has to be supported and bracketed with properly sized and designed brackets consisting of two half sections clamped over the pipe and shall with two hanger rods.

Pipes to be pressure tested in sections as specified in this specification.

(b) Roof outlets

Where waterproofing is installed, as for roof slabs, an adjustable roof outlet/drainage point to be used consisting of a cast-iron unit with cast-iron ring clamp to fit over waterproofing edge and an adjustable height outlet to fit in with the screed level. For surfaces such as paving and walkways a flat grating of brass or cast iron shall be used with a catch basket. Within paving blocks a square top frame shall be used. For roof outlets a domed grating is to be used. Where roofs are to be covered with stones, a mesh shall be installed to prevent any stones from entering the rainwater system.

Two-way side outlets shall be used in cases where required.

Floor and roof outlets to be fitted to cast-iron pipe by means of SSN couplings.

A 04.03 SOIL AND WASTEWATER DRAINAGE SYSTEM

A 04.03.01 General

Corrective maintenance to the soil and wastewater drainage system shall include but not be limited to the following:

(a) Replacement of damaged, broken, leaking, corroded above and underground pipework and fittings;

(b) Replacement of damaged, broken and missing gully gratings, manhole covers and frames, cleaning eye covers, screws and bolts, inspection eye covers, end caps and vent cowls;

(c) Corrective maintenance to damaged manholes, gullies, cleaning eyes, floor drains, etc, including builder's work and benching;

(d) Initial unblocking only of all blocked drainage pipework, traps, floor drains, gullies and the cleaning of sanitary ware equipment;

(e) Servicing of soil and wastewater drainage systems where necessary;

(f) Work to bracketing systems including fixing and servicing of existing brackets and the introduction of additional brackets where required;

(g) Re-align, re-fix and bracket sanitary ware equipment to walls, floors, etc, where required;

(h) Service and clean out sanitary ware and equipment traps;

(i) Test pipe system, traps and equipment for leakage;

A 04.03.02 **Material and equipment specification for soil and wastewater drainage systems**

Materials and equipment to be used shall be suitable and/or adaptable to the existing installation and shall comply with the following:

(a) uPVC soil and waste pipe and fittings

UPVC soil, vent and waste pipe systems can be used for underground and above ground drainage installations. This piping shall conform in all respects to SANS 971 for underground systems and to SANS 967 for above ground systems.

All underground pipes, as well as soil pipes above ground, shall be joined by means of rubber ring seal couplings and fittings in accordance with the manufacturer's specification. All waste and vent pipes shall be joined by means of solvent weld fittings and couplings. The solvent weld glue to be used shall be as specified by the pipe manufacturer, allowing for thermal contraction and expansion.

The piping system shall be pressure tested in accordance with the NBRI information sheet X/BOU 2-34.

A 04.04 **DOMESTIC WATER DISTRIBUTION AND RETICULATION NETWORKS**

A 04.04.01 **General**

Servicing and Maintenance work to the domestic water distribution shall include, but not be limited to the following:

(a) Replacement of damaged, broken, leaking, corroded above and underground pipe work, fittings and equipment;

(b) Replace and service valves, which shall include new gaskets, gland packings, seals, bolt and nuts, etc;

(c) Where valves do not close properly, all these valves shall be refurbished, descaled or replaced where necessary;

(d) Clean and service all strainers, including the replacement of strainer elements where corroded and installation of new gaskets;

(e) Service, test and readjust pressure-reducing valves. Pressure gauges are to be recalibrated and checked. Up and downstream pressures are to be logged. Downstream pressure has to be adjusted to an acceptable level, taking into account the allowable working pressure of the system and its components;

(f) Service and check the proper functioning of all non-return valves;

(g) Service, readjust and calibrate all safety and expansion relief valves;

(h) Service and clean out all air release valves and vacuum breakers;

(i) Work to bracketing systems including fixing and servicing of existing brackets and provision of additional brackets where required;

(j) Hot-water pipe lagging and cladding shall be inspected, serviced, sealed and replaced where required;

(k) Service and log readings of water meters including cleaning of integral strainers;

(l) Water supply has to be sampled monthly and chemically analysed for the suitability to the systems and materials it serves;

(m) Domestic geysers are to be serviced in accordance with the manufacturer's specification and SANS 10254 shall include descaling, replacement of elements, testing for any leaks, checking of safety valve operation (replace if required), testing of the thermostat operation and set point (replace if necessary);

A 04.04.02 **Material and equipment specification for domestic water distribution and reticulation networks**

Materials and equipment to be used shall comply with the following requirements:

(a) Copper pipe installation

(i) The installation of copper piping systems shall be done in accordance with the manufacturer's instructions and all relevant codes, standards and regulations.

(ii) Copper pipes shall only be installed downstream of galvanized mild steel pipes when applicable.

(iii) Where dissimilar metals are joined, dielectric or isolating couplings shall be used. This is not required where copper and brass dezincified alloys join.

(iv) Copper pipes shall be of the hard drawn type Class 0 or Class 2 (as described in the schedule of quantities) in accordance with SANS 460 and shall be joined by means of capillary soldered type fittings. No compression type fittings shall be allowed unless otherwise specified.

(v) Copper capillary soldered type fittings shall be used in accordance with ISO 2016, SANS 1067, DIN 2856 or BSS 864.

(vi) The soldering flux to be used shall be water based and easily flushed out, withstand temperatures above 240 °C and shall contain no ammonia. The flux shall be non-toxic when dissolved in water.

(vii) The solder to be used shall be in accordance with SANS 24 and shall consist of a material containing 97 % tin and 3 % copper. Solders containing lead, resin core and acid core shall not be used.

(viii) The heat source to be used shall be propane gas with induction air, at a temperature not higher than 240 °C. The pipe ends and fittings shall be cleaned and waxed with an approved solder flux, before soldering. The pipe and fittings shall then be fitted together and heated to the correct temperature before the solder is applied. Care must be taken not to add too much or to little solder to the joint. Immediately after setting of the solder the joint shall be wiped clean with a wet cloth. Pipes shall be washed out as soon as possible after jointing and all traces of flux shall be removed.

(ix) All bronze or brass equipment and fittings shall be of the dezincification resistant (DZR) type.

(x) Copper pipes and fitting shall be installed strictly to the manufacturer's specification which shall include the following:

(1) No labour bends;

(2) Provision for thermal contraction and expansion of pipes;

(3) Pipe brackets shall be installed at appropriate positions where pipes are installed on surface level;

(4) Pipes chased or built into walls or floors shall be wrapped with two layers of building paper or similar approved material. Hot and cold water pipes running next to each other shall be at least 50 mm apart;

(5) Equipment fixed to copper pipe outlets, where the pipes are surface mounted or built into walls, shall be done by means of copper wall plate fittings on the copper pipes, properly secured to the structure to prevent structural damage to soldered joints.

(xi) Pipe hangers and brackets shall be of copper, copper alloy or non-conductive materials. No piece of copper pipe shall touch any other conductive surface. Brackets shall be designed to structurally support and fix the pipe system, and shall allow enough clearance from walls, soffits, etc, to insulate hot-water pipes and maintain equipment.

(xii) Pipe hangers and brackets shall be installed according to the manufacturer's specification on the following maximum spacings:

PIPE DIAMETER (mm)	HORIZONTAL (metre)	VERTICAL (metre)
15	1,3	1,9
22 and 28	1,9	2,5
35 and 42	2,5	2,8
54	2,5	3,9
67 – 108	2,8	3,9

(xiii) All copper pipes open to structural damage, shall be protected by steel sleeves or a structurally designed cover.

(xiv) All pipework shall be pressure tested and sterilised as specified.

(xv) Where flanged fittings are used, cadmium-plated bolts, nuts and spring washer shall be used to join these flanges.

(xvi) All water pipes shall be lagged as specified.

(xvii) Shut-off valves shall be installed on all branch pipes and ball-o-stop valves shall be installed on all connectors to basin pillar cocks, sink mixers, cistern type WCs and other fittings.

(xviii) All pipes shall be marked in accordance with SANS 0140-1 or as specified by the Engineer.

(xix) Approved type expansion bellows shall be installed where required for expansion and contraction to prevent excessive strain on fittings and soldered joints.

(b) PVC-U underground pipe installations

(i) PVC-U piping shall conform to SANS 966 with rubber ring type joints.

(ii) All bends shall be PVC-U type fittings with rubber ring joints.

(iii) All other fittings such as T-pieces, reducers, flanges, etc, shall be bitumen-dipped cast-iron rubber ring jointed fittings to SANS 546.

(iv) No solvent weld type fittings will be allowed.

(v) All cast-iron fittings shall be coated and wrapped to SANS 1117.

(vi) All pipes shall be laid on a 100 mm sand-bedding cradle and covered with 300 mm sand before backfilling.

(vii) HDPe pipe connections to uPVC pipes up to 50 mm can be done by means of SG Iron manufactured saddles with the appropriate gaskets and cadmium-plated bolts and nuts.

(viii) All pipework shall be pressure tested with all joints uncovered, to the satisfaction of the Engineer.

(ix) Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipeline.

(c) HDPe underground pipe installations

(i) HDPE piping shall be Type 4 HDPe pipe to SANS 533.

(ii) All fittings shall be of Plasson compression type and shall conform to ISO/DIS 3458.

(iii) All pipes shall be laid on a 100 mm sand bedding cradle and covered with 300 mm of sand of selected material.

(iv) All backfilling shall be in accordance with SANS 1200 DB and to the Engineer's and approval.

(v) Pipe trenching and bedding:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle traffic	1 100	Flexible pipe bedding as per SANS 1200 LB	Soilcrete
Under surface bed	600		Soilcrete
Other areas	900		90 % of modified AASHTO density

(vi) No concrete shall come into direct contact with the HDPe pipe. At these points the fittings shall be wrapped with Densopol 80 HT tape or similar approved.

(vii) All pipe crossings under traffic areas shall be backfilled with soilcrete and compacted as specified.

(viii) All pipework shall be pressure tested with all joints uncovered to the satisfaction of the Engineer.

(ix) Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipeline.

(d) Valves

(i) Gate valves underground in valve chambers to connect to uPVC piping (65 mm NB and larger)

Gate valves are to be equipped with non-rising spindle, spherical graphite iron body to SANS 936 Grade 42, cast-iron nitrile butadiene rubber covered gate, stainless steel spindle, nitrile butadiene rubber O-rings and seals, cast-iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valves shall conform to SANS 664 and/or 665 and shall be capable of withstanding a working pressure of 1 600 kPa.

The valves shall be fitted with a square key spindle top to close the valves in clockwise direction and socket ends to SANS 665 to fit into uPVC Class 12 pipe and shall be installed to details provided.

(ii) Gate valves underground in valve chamber to connect to HDPe piping

The gate valves shall be of the dezincified brass type with brass gate, brass body, non-rising spindle and BSP threaded socket ends. The valves shall conform to SANS 776 Class 125. The valves shall be able to withstand a working pressure of 1 600 kPa. The valve shall be fitted with a hand wheel on an extended spindle shaft of 700 mm to close in a clockwise direction and shall be installed to details provided.

(iii) Gate valves above ground for temperatures up to 40 °C to connect to steel piping (65 mm NB and larger)

Gate valves are to be equipped with non-rising spindle, spherical graphite iron body to SANS 936 Grade 42, cast-iron nitrile butadiene rubber covered gate, stainless steel spindle, nitrile butadiene rubber O-rings and seals, cast-iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valves shall conform to SANS 664 and/or 665 and shall be capable of withstanding a working pressure of 1 600 kPa.

The valves shall be fitted with flanged ends to SANS 1123, table 16, hand wheel to close the valves in a clockwise direction and installed in an upright position or sideways to a maximum 90 ° from upright.

(iv) Gate valves above ground for temperatures above 40 °C to connect to steel piping (65 NB mm and larger)

Gate valves shall be equipped with non-rising spindle, spherical graphite iron body to SANS 963 Grade 42, cast-iron gate,

gunmetal seat and gate rings, high-tensile bronze spindle, cast-iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valves shall conform to SANS 665 and shall be capable of withstanding a working pressure of 1 600 kPa and a temperature of 90 °C.

The valve shall be fitted with flanged ends to SANS 1123, table 16, hand wheel to close the valve in a clockwise direction and installed in an upright position or side ways to a maximum 90° from upright.

(v) Gate valves above ground to fit to copper pipes (65 mm NB and larger)

Gate valves shall be equipped with non-rising spindle, gunmetal bronze or dezincified brass body, gunmetal or dezincified brass gate and graphite asbestos packing in the gland.

The valve shall be fitted with a hand wheel to close in a clockwise direction and installed in an upright position or sideways to maximum 90° from upright.

The valve shall be equipped with flanges to SANS 1123, table 16, hand wheel to close the valve in a clockwise direction and installed in an upright position or sideways to a maximum 90° from upright.

(vi) Gate valves above ground for temperatures up to 100 °C (up to 50 mm NB)

The gate valves shall be of the dezincified brass type with brass gate, brass body, non-rising spindle and BSP threaded socket ends. The valve shall conform to SANS 776, Class 125.

The valves shall be able to withstand a working pressure of 1 600 kPa.

The valve shall be equipped with a hand wheel to close in a clockwise direction.

The valve shall be installed in an upright position or sideways to a maximum 90° from upright and shall be so placed with other fittings to be removable without cutting the pipework.

(vii) Ball-O-Stop valves (15 mm diameter - 25 mm diameter)

These valves shall be full-way ballcock type with BSP threaded ends. The valves shall conform to SANS 1056, Part 3, shall be rated for a test pressure of 2 000 kPa, and shall be chrome-finished where exposed.

(viii) Angle regulating valves

These valves shall be 15 mm chromium-plated angle regulating valves with a 350 mm chromium-plated copper tube and cap nuts where required.

(e) Water meters

(i) Combination water meters

Where high peak flow, as well as a small flow, can occur and the small flow is out of the registration range of the large water meter, a small water meter shall be installed in parallel with the large water meter to cater for the small flows with integral automatic change-over valves. These valves shall be designed to have a minimum pressure drop at operating point.

(ii) Water meters (50 mm NB and larger)

These water meters shall be of the dry type with all gears and transmission and roller counters in a dry head, and shall be equipped with flanged ends to SANS 1123, cast-iron body with high quality corrosion-proof coating. The meter shall be protected from magnetic fields and sealed to prevent tampering with adjustments. The meter must be able to work up to a pressure of 1600 kPa under a maximum water temperature of 40 °C. The scale of meter must be in cubic metre (m^3) and equipped with needle indicators reading in litres. Accuracy of meter shall be not less than 98 %.

The meters shall be installed with leading and trailing lengths of pipes to the manufacturer's specification.

(iii) Water meters (up to 50 mm NB)

The meter shall be of the volumetric rotary piston type with brass body equipped with union couplers. The meter reading must be in kilolitres. The meter shall have an accuracy of not less than 98 %. The meter must be able to operate up to a water pressure of 1000 kPa at a water temperature of 40 °C.

The meters shall be installed with leading and trailing lengths of pipes to the manufacturer's specification.

(f) Lagging of water pipes

(i) Preformed closed cell flame retarded flexible insulation sections

Where pipes are installed in service ducts, ceiling voids, etc, the pipes shall be insulated with Thermaflex preformed pipe insulation sections. This insulation shall be used with pipe systems where the maximum temperature is 80 °C. For a temperature higher than 80 °C preformed fibreglass sections shall be used with galvanized sheet metal muffs.

All bends and T-pieces shall be cut in a 45° mitre box to form a neat joint. All joints shall be glued together with a contact adhesive supplied by the manufacturer. Pipe sizes larger than 50 mm diameter shall be insulated with preformed fibreglass sections with canvas covers glued together with cold wood glue.

Thermaflex thickness for various pipe sizes shall be as follows:

PIPE SIZE (STEEL)	PIPE SIZE (COPPER)	THERMAFLEX THICKNESS
50 mm dia	54 mm dia	20 mm
40 mm dia	42 mm dia	20 mm dia
32 mm dia	35 mm dia	15 mm dia
25 mm dia	28 mm dia	15 mm dia
20 mm dia	22 mm dia	15 mm dia
15 mm dia	15 mm dia	15 mm dia

A 04.05 **SANITARY AND BRASSWARE EQUIPMENT**

Servicing work to the sanitary and brassware equipment shall include but not be limited to the following:

(a) Damaged and/or broken irreparable sanitary and brassware equipment shall be replaced with equal specification equipment or approved alternative. These shall be installed strictly to the manufacturer's specifications.

(b) Sanitary and brassware equipment that is unsuitable for the purpose and application they serve are to be replaced with suitable equipment.

(c) The quantities of sanitary and brassware equipment needed for the number of people and application they serve, shall be investigated in accordance with the current SANS 10400 application regulations. If found to be insufficient these items of equipment facilities shall be increased only if approved by the Engineer.

(d) Loose sanitary ware shall be re-fixed and bracketed to structures in accordance with the manufacturer's specifications.

(e) Stained sanitary ware equipment shall be cleaned, where possible, with approved cleaning agent in accordance with the manufacturer's specification.

(f) All cisterns are to be cleaned out and filling and flushing mechanisms shall be serviced and adjusted.

(g) Unserviceable flush valves to be serviced utilizing the manufacturers repair kits only.

(h) All pillar taps, mixers, sink taps and other taps are to be serviced, utilising repair kits. Where equipment connections are loose these shall be properly secured to sanitary ware and other equipment.

(i) Replace missing and/or damaged shower gratings with gratings of equal specification or approved alternatives.

(j) Service water metering taps by utilising manufacturer's replacement kits where necessary. Where damaged beyond repair the complete item shall be replaced with one of equal specification or approved alternative.

(k) Readjust all timing mechanisms on flush valves and metering taps to the correct flushing and flow times.

(l) Replace missing or damaged toilet seats and covers.

(m) Service and clean out all bottle traps.

(n) Service bath taps and mixers by utilising manufacturer's replacement kits.

A 04.06 **FIRE WATER PIPED RETICULATION NETWORKS**

Servicing work to the fire water piped reticulation networks shall include but no be limited to the work described below.

This specification only covers the water piped reticulation for the fire water protection system, while the equipment related to this installation, such as fire hydrants, hose reels and extinguishers are covered and detailed in Technical Specification JC: Fire Fighting Equipment. This specification has to be read in conjunction with the afore-mentioned specification.

(a) Service valves which shall include the installation of new gaskets, gland packings, seals, bolt and nuts, etc. If necessary the valves shall be replaced.

(b) Where valves do not close properly, all these valves are to be refurbished, de-scaled and if necessary replaced.

(c) Service and check the proper functioning of all non-return valves and backflow preventers.

(d) Service, readjust and calibrate all pressure gauges.

(e) Service bracketing systems including fixing of existing brackets and the provision of additional brackets where required.

(f) Pressure test and sterilise new installations and equipment.

A 05 MEASUREMENT AND PAYMENT

A.01 SUPPLY AND INSTALLATION OF SANITARY WARE AND BRASSWARE..... Unit: metre, number

The unit of measurement shall be the number of each item of sanitary and brassware supplied and installed, including all associated pipe work and fittings.

The tendered rate shall include full compensation for the removal of existing, supply, delivery, positioning, installation, testing, cleaning, commissioning and hand-over of sanitary and brassware including all necessary pipe work, traps, brackets, connectors, fittings, bends, junctions, cleaning eyes, etc, to connect the sanitary and brassware to the existing water supply and/or drainage installation.

The tendered rate shall also include full compensation for chasing and/or building into walls and the reinstating of existing surfaces such as floors, walls, ceilings, etc.

Existing sanitary and brassware:
Vitreous china WC pan: white Vaal "Aquasave" - code 750151
Vitreous china WC cistern: white Vaal 9 litres - code 750151
Toilet seat and covers: Type A1 DELUXE
Vitreous china wall mounted wash hand basin: Vaal "BANTAM" - code 7030
Pillar taps 15 mm ø CP: Cobra - code 111-15
Wall-mounted sink mixer CP 15 mm ø Cobra - code 266/041/10
Shower rose with ball joint connector: 15mm CP "Prestex" - Cobra code 065
Under tile stop-cocks: 15 mm ø "STAR" Cobra "COPCAL" - code 139-15
Shower grating: CP Cobra - code 323
Pillar taps 20 mm ø CP: Cobra - code 111-20
Wall-mounted vitreous china urinal: White Vaal "LAVATERA" - code 70401
Chromium-plated bottle trap: code 365/50
Exposed flush valve Cobra junior flush master: code FJ 6.001
Hose biptap: Rough brass, with BSP hose union, 20mm: cobra code 108-20

A.02 SUPPLY AND INSTALLATION OF DOMESTIC WATER PIPING INSTALLATION..... Unit: metre

The unit of measurement shall be the metre of each type of piping in the installation supplied and installed, indicating all fixtures and fittings.

The tendered rates shall include full compensation for the supply, delivery, installation, testing, cleaning, sterilising, commissioning and hand-over of new water piping installed on surface against walls or soffits, underground, in ceiling voids, chased or built into walls and/or in service ducts, including all necessary bends, tees, reducers, elbows, valves, strainers, adapters, brackets, hangers, etc, to hand over a complete and effective installation that complies with local government regulations.

The tendered rates shall also include full compensation for the necessary underground works such as excavation, pipe bedding, fill blanket, backfilling and compaction and for the reinstatement of existing surfaces such as floors, walls, ceilings, roads, paving, etc, as well as connection to the existing domestic water installation.

A.03 **REPLACE AND INSTALLATION OF DOMESTIC GEYSER INSTALLATION** .....Unit: number

The unit of measurement shall be the number of each geyser installation supplied and installed, including all associated pipe work and fittings.

The tendered rates shall include full compensation for the removal of existing, replacement and installation of domestic geysers, including shut-off valves, non-return valves, strainers, pressure-reducing valves, vacuum breakers, air release valves, safety valves, etc, as well as connection to existing piping and electrical supply.

Existing geysers: Kwikot Econoflo, 150 litre, 2 kW

A.04 **SERVICING AND CLEANING OF SANITARY WARE** ..... .Unit: number

The unit of measurement shall be the number of each item of sanitary ware serviced and cleaned, including all associated pipe work and fittings.

The tendered rate shall include full compensation for the servicing of all movable parts, cleaning of stained sanitary ware with approved cleaning agent, fixing of loose fixtures and brackets according to manufacturer's specifications, de-scaling and cleaning of cisterns and servicing of filling and flushing mechanisms, cleaning of all traps, fixing damaged or missing shower, urinal and channel outlet gratings.

A.05 **SERVICING, OVERHAULING AND CLEANING OF BRASSWARE** ..... Unit: number

The unit of measurement shall be the number of each item of brassware serviced, overhauled or cleaned, including all associated pipe work and fittings.

The tendered rate shall include full compensation for dismantling, cleaning and de-scaling, replacement of all gaskets, gland packing and seals on all valves, replacement kits for worn or leaking flush valves, taps and mixers and metering taps and any other work or action required to hand over an effective system that complies with local government regulations.

A.06 **SERVICING AND CLEANING OF DOMESTIC WATER AND DRAINAGE PIPE INSTALLATIONS** ..... Unit: number, metre, item

The unit of measurement shall be the metre of each type of pipe installation serviced, cleaned and repaired, including all fixtures and fittings.

The tendered rates shall include full compensation for inspection, sampling testing, servicing, cleaning and repair of existing piping and equipment such as:

(a) Unblocking and cleaning of all drainage pipe work, traps, floor drains and gullies;

(b) Repair of existing bracketing systems including fixing and repair of existing brackets and hangers, as well as the supply and installation of additional brackets where required;

(c) Service and repair to all valves, strainers, pressure-reducing valves, water meters, non-return valves, air release valves and vacuum breakers, including new gaskets, gland packing and seals;

(d) Repairing and/or replacement of damaged pipe lagging and cladding;

A.07 **SERVICING AND CLEANING OF DOMESTIC GEYSERS** ..... Unit: number

The unit of measurement shall be the number of domestic geysers serviced, cleaned and repaired, including all fixtures and fittings.

The tendered rate shall include full compensation for the isolation, servicing, cleaning and testing of domestic geysers in accordance with the manufacturer's specifications, including de-scaling, testing for leaks, replacing of elements if required, checking of safety valve operation and replacement if required, testing of thermostat operation and set point and replacement if required, and any other work or action to hand over an effective system that complies with local government regulations.

TECHNICAL SPECIFICATION

AB BUILDING ELECTRICAL INSTALLATIONS

CONTENTS

AB 01 SCOPE

AB 01.01 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

AB 01.02 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.

AB 02 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

AB 02.01 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.

AB 02.02 **SANS Specifications**

General	Distribution and meter boards	LV cables and conductors	Lighting system	Earthing and lightning protection system	Small power installation	
					Power outlets	Conduits, powerskirting, cable trays and ducting
SANS 10142-1	SANS 152		SANS 10114-1	SANS 03	SANS 152	SANS 950
SANS 10160	SANS 156	SANS 0198	SANS 163	SANS 0199	SANS 164	SANS 1065-1
SANS 10400	SANS 172	SANS 1411-1	SANS 1012		SANS 1084	SANS 1085
SANS 1222		SANS 1507	SANS 1084		SANS 1239	
			SANS 1250			
			SANS 1279			
			SANS 1777			
			SANS 10114-2			

AB 02.03 **Department of Public Works Specifications PW 774 and PW 343.**

AB 02.04 **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.**

AB 02.05 **Manufacturer's specifications and installation instructions.**

AB 02.06 **Additional requirements**

Equipment and material installed shall be new and unused.
Luminaires, control gear, isolators and power outlets shall bear the SANS 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.

AB 03 OPERATING AND MAINTENANCE MANUALS

AB 03.01 No operating and maintenance manuals shall be developed for this section.

The contractor shall use the maintenance control plan to schedule preventative maintenance actions.

AB 04 TESTS AND INSPECTIONS PRIOR TO PRACTICAL COMPLETION

AB 04.01 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.

AB 04.02 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:

AB 04.02.01 continuity of ring final circuit conductors
AB 04.02.02 continuity of protective conductors, including main and supplementary equipotential bonding
AB 04.02.03 earth electrode resistance
AB 04.02.04 insulation resistance

AB 04.02.05 polarity
AB 04.02.06 earth fault loop impedance
AB 04.02.07 operation of residual current devices
AB 04.02.08 phase voltage
AB 04.02.09 current per phase
AB 04.02.10 illumination levels in lux

AB 04.03 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.

AB 05 LOGGING AND RECORDING PROCEDURES

AB 05.01 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.

AB 05.02 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:

AB 05.02.01 Bi-annual inspection and testing of all systems.
AB 05.02.02 Monthly lamp inspection and maintenance actions.
AB 05.02.03 Annual earthing test report.
AB 05.02.04 Bi-annual inspection and testing of distribution boards.

AB 06 MAINTENANCE TOOLS AND SPARES

AB 06.01 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.

AB 06.02 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.

AB 06.03 The Tools and Spares shall at least include the following:

10 of 100W GLS lamps
20 of PL 9W lamps
20 of 36W fluorescent lamps
10 0f 28W fluorescent lamps
40 of 58W fluorescent lamps
10 of 250W HPS lamps
05 of 80W MV lamps
Distribution kiosk key
DB face plate square key
DB face plate triangular key

AB 06.04 Tools and Spares: Measurement and payment

Item		Unit
(a)	**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.

AB 07 QUALITY ASSURANCE SYSTEM

AB 07.01 Following formal approval of his Quality Assurance system by Engineer, the Contractor shall implement the approved QA system.

AB 07.02 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.

AB 08 RE-COMMISSIONING OF INSTALLATION

AB 08.01 On practical completion of the repair work, the contractor shall re-check and put all systems into operation.

AB 08.02 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.

AB 08.03 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

AB 09 REPAIR WORK TO LIGHTING INSTALLATIONS

AB 09.01 The various electrical systems shall be repaired during the first phase of the repair and maintenance contract.

AB 09.02 The scope of the repair work shall include, but shall not be limited to the activities listed below.

AB 09.03 The Contractor shall record the repair actions in tabular format before the Contractor's responsibility for maintenance commences.

AB 09.04 Repair work shall be executed within the approved period for repairs.

AB 10 INSTALLATION TECHNICAL DETAILS

AB 10.01 Installation description

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

Installation A: Monantsa Pass Port of Entry

Installation B: Peka Bridge Port of Entry

AB 10.02 Scope of repair work

AB 10.02.01 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.

(i) Trace outgoing circuits.

(j) Fit labelling and blank face plate covers.

(k) Replace the distribution boards if required and replacement is approved by Engineer. Check earth bar and earth continuity, record.

(l) Label all wiring and cabling with Grafoplast Trasp PVC markers.

(m) Replace all circuit breakers that are rated below 5 kA.

AB 10.02.02 Lighting system

(a) Indoor luminaires

(i) Operational and complete luminaires

- 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, lampholder 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

- Remove luminaire.
- Replace luminaire with 1500mm double fluorescent luminaire.
- Fit new lamps.

(b) Light switches

Note: All light switches shall have steel faceplates 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 ø 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

TYPE	DESCRIPTION
A	2 x 58W SANS OPEN CHANNEL FLUORESCENT LUNINAIRE - LASCON TYPE : R1-258 SS
B	2 x 36W SANS OPEN CHANNEL FLUORESCENT LUNINAIRE - LASCON TYPE : R1-236 SS
C	1 x 58W SANS OPEN CHANNEL FLUORESCENT LUMINAIRE - LASCON TYPE : R1-158 SS
D	1 x 36W SANS OPEN CHANNEL FLUORESCENT LUMINAIRE - LASCON TYPE : R1-136 SS
E	2X58W INDUSTRIAL, CORROSION PROOF & PROTECTED LUMINAIRES LASCON TYPE : P20-N-265SS
F	2 x 58W SANS IP 55 FLUORESCENT LUMINAIRE - LASCON TYPE : C2-258SS WITH WATERTIGHT DIFFUSER
G	2 x 36W SANS IP 55 FLUORESCENT LUMINAIRE - LASCON TYPE : C2-236SS WITH WATERTIGHT DIFFUSER
H	70W HPS B40 BRITELITE WALL MOUNTED BULKHEAD LUMINAIRE : LASCON TYPE B40-70W HPS
I	80W MV B40 BRITELITE WALL MOUNTED BULKHEAD LUMINAIRE : LASCON TYPE B40-80W MV
J	80W MV WALL MOUNTED LUMINAIRE BEKA TYPE: AZIMUTH 80W MV ACRYLIC
K	BULKHEAD LUMINAIRE - LASCON TYPE: B10 WITH 2XPL9 LAMPS
L	BULKHEAD LUMINAIRE - LASCON TYPE: B10 WITH 21 W DULUX EL ECO LAMP
M	BULKHEAD LUMINAIRE - LASCON TYPE: B20 WITH 2XPL9 LAMPS
N	DÉCORATIVE ROUND BULKHEAD WITH GRID – ILM TYPE: BHD/CMO/MO/GR
O	DÉCORATIVE OVAL BULKHEAD WITH EYELID – ILM TYPE: BHD/CMO/OVL/EL
P	125W MV FLOODLIGHT LUMINAIRE WITH GRP BODY: ILM TYPE: GAL/GRP/125/MV
Q	400W HPS FLOODLIGHT LUMINAIRE : LASCON TYPE : L14ST-400 HPS
R	250W HPS FLOODLIGHT LUMINAIRE : LASCON TYPE : L14ST-250 HPS
S	2X PL26W FLOODLIGHT LUMINAIRE BEKA TYPE: BEKA FLOOD
T	BOWL TYPE IP55 BATHROOM FITTING WITH CERAMIC LAMP HOLDER WITH DULUX EL ECO 21W/E27 LAMP
U	DÉCOR ROUND CHEESE BULKHEAD 250 MM GLASS BOWL-ILM TYPE: DEC/RND/CHS/250 WITH 21 W DULUX EL ECO LAMP
V	WALL MOUNTED DÉCOR SPOT LIGHT ILM TYPE : ACC/SPT/100
W	CEILING MOUNTED 3 LIGHT DECORATIVE LUMINAIRE WITH GLASS CUPS AND DULUX EL ECO 21W/E27 LAMPS
X	CEILING MOUNTED 2 LIGHT DECORATIVE LUMINAIRE WITH GLASS CUPS AND DULUX EL ECO 21W/E27 LAMPS
Y	CEILING MOUNTED SINGLE LIGHT DECORATIVE LUMINAIRE WITH GLASS CUPS AND DULUX EL ECO 21W/E27 LAMPS
Z	EXTERNAL WATERTIGHT FITTING(IP55)-COMPLETE WITH GALLERIE AND 100 W GLS LAMP LITEMASTER TYPE: 8910
AA	BULKHEAD LUMINAIRE - BEKA TYPE SERIES 30: WITH 2XPL9W CFL LAMPS
AB	CEILING MOUNTED LUMINAIRE WITH STEEL DOME REFLECTOR AND 21W DULUX EL ECO LAMP
AC	CEILING FAN WITH 1 X GLASS CUPS AND 100W GLS LAMPS

AB 10.02.03 Power outlets and fixed appliances

Note: All power outlets shall have steel faceplates 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, powerskirting and surface conduiting, fasten or replace if loose or damaged, check earthing and test for earth continuity.

AB 10.02.04 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 50 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) Installation of 50mm² aluminium roof conductor in galvanised conduit from the roof cladding against the building to the earth electrode.

AB 10.03 Repair work: measurement and payment

AB.01 Distribution boards and cabling

Item	Unit
AB.01.01 Service distribution board	No

The unit of measurement shall be the number of distribution kiosks or boards opened and serviced as specified in 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 Traffolite labels, neutral bars, earth bars etc. All downstream circuit breakers shall be rated at 6 kA fault level.

	Item	Unit
AB.01.02	**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
AB.01.03	**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
AB.01.04	**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
AB.01.05	**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
AB.01.06	**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 mm locally manufactured padlocks and locking devices as well as fitting each of the three keys with purpose-made pvc labels.

	Item	Unit
AB.01.07	**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
AB.01.08	**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
AB.01.09	**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
AB.01.10	**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
AB.01.11	**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
AB.01.12	**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
AB.01.13	**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
AB.01.14	**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
AB.01.15	**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
AB.01.16	**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
AB.01.17	**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
AB.01.18	**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
AB.01.19	**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
AB.01.20	**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.

AB.02 Lighting system

	Item	Unit
AB.02.01	**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
AB.02.02	**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 luminaires internal wiring where applicable and the tightening of all connections

	Item	Unit
AB.02.03	**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, according to manufacturer's instructions.

	Item	Unit
AB.02.04	**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
AB.02.05	**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
AB.02.06	**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
AB.02.07	**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, spray painting, 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
AB.02.08	**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
AB.02.09	**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 instructions.

	Item	Unit
AB.02.10	**Replace Luminaire internal components**	No

The unit of measurement shall be the number of SANS approved internal luminaire components replaced.

The tendered rate shall include full compensation for the removal of the defective component and for the supply, installation and testing of the specified type of component to the manufacturer's instructions.

AB.03 **Small power and fixed appliances**

Item	Unit
AB.03.01 **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
AB.03.02 **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
AB.03.03 **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
AB.03.04 **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
AB.03.05 **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
AB.03.06	**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
AB.03.07	**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
AB.03.08	**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
AB.03.09	**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 powerskirting including all accessories.

	Item	Unit
AB.03.10	**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
AB.03.11	**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
AB.03.12	**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
AB.03.13	**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
AB.03.14	**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, inspection of the contact points, switching mechanism, earthing and re-connection of the ceiling fan.

	Item	Unit
AB.03.15	**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
AB.03.16	**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
AB.03.17	**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 control switch.

The tendered sum shall further include for the provision of connection to the ceiling fan.

	Item	Unit
AB.03.18	**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 component.

The rate shall further include the disconnection and removal of the faulty component and the installation and testing of the new component.

	Item	Unit
AB.03.19	**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 component.

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
AB.03.20	**Supply and Install Stove**	No

The unit of measurement shall be the number of electrical 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
AB.03.21	**Provide Certificate of Compliance**	No

The unit of measurement shall be the number of Certificate of Compliance obtained from local authorities and issued to the Engineer.

The tendered rate shall include full compensation for the testing and all associated equipment to complete the Certificate of Compliance and certification thereof.

AB.04 **Earthing and bonding**

Item	Unit
AB.04.01 **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
AB.04.02 **Testing of the earth installation by a specialist contractor**	Lump sum

The tendered lump sum shall include full compensation for the testing of the earth installation by a specialist contractor approved by the Engineer.

Item	Unit
AB.04.03 **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
AB.04.04 **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
AB.04.05 **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 there off onto a 1,2 m Cu earth electrode driven into the soil 1,8 m deep.

AB 11 MAINTENANCE OF THE INSTALLATION

AB 11.01 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.

AB 11.02 The following maintenance actions will be required under this contract::

AB 11.02.01 routine preventative maintenance
AB 11.02.02 corrective maintenance
AB 11.02.03 breakdown maintenance

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

AB 11.03 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.

AB 11.04 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.

AB 11.04.01 Monthly maintenance

(a) Check operation of protective and monitoring devices.

(b) Verify operation of switching elements and meters.

(c) Check lamp operation

(d) Measure phase voltages and currents in distribution boards and record values in Record book

(e) 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.

AB 11.04.02 Annual maintenance

(a) Service all luminaires, distribution boards, socket outlets, isolators, light switches, etc.

(b) Carry out all tests listed under section AB 04.02 above and record values in the Record book

(c) Witnessed testing of all earth leakage protection units on all socket outlet units.

(d) 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.

AB 11.05 Maintenance work: Measurement and payment

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

TECHNICAL SPECIFICATION

B BUILDING STRUCTURAL ELEMENTS

CONTENTS

B 01 SCOPE

This specification covers the maintenance and servicing of all building structural elements relating to existing roofs, carpentry, joinery, fittings, walls, doors, windows floors and paintwork.

Maintenance and Servicing of this part of the installation shall be performed in accordance with Additional Specifications SA: Maintenance and Servicing

B 02 STANDARD SPECIFICATIONS

The latest edition, including all amendments 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:

PW 371	-	Specification of Materials and Methods to be used, fourth edition, Oct 1993
SANS 1200HB	-	Cladding and Sheeting
SANS 1783-4	-	Softwood brandering and battens
SANS 1273	-	Fasteners for sheet roof and wall coverings
SANS 266	-	Gypsum plasterboard
SANS 1783-2	-	Stress-graded softwood: general structural timber
SANS 1783-4	-	Softwood brandering and battens
SANS 803	-	Fibre-cement boards
SANS 22	-	Glazed ceramic wall tiles and fittings
SANS 545	-	Wooden doors
SANS 622	-	Gypsum cove cornice
SANS 680	-	Glazing putty for wooden and metal window frames
SANS 10107	-	The design and installation of ceramic tiling
SANS 1236	-	Silvered glass mirrors for general use
SANS 1263	-	Safety and security glazing materials for buildings
SANS 10186	-	The laying of textile floor coverings
SANS 1449	-	Ceramic wall and floor tiles
SANS 515	-	Decorative paint for interior use
SANS 630	-	Decorative high gloss enamel paints
SANS 634	-	Emulsion paints for exterior use
SANS 681	-	Undercoats for paints

SANS 887	-	Varnish for interior use
SANS 064	-	The preparation of steel surfaces for coating

B 03 GENERAL INCLUSION OF COSTS

All material scheduled to be removed shall be deemed to be existing damaged materials in small or large sections. All such redundant material shall become the property of the Contractor and must be removed from site immediately.

All new material shall be deemed to be in patchwork and shall be of approved equal quality, colours, profiles, thickness, etc and shall in all cases match the existing materials and shall be fixed (internally or externally) to existing material or surfaces.

All replacement, removal and servicing work shall be done carefully as to not damage any adjacent or other material or work. Any damage to other or adjacent materials or areas caused by the negligence of the Contractor shall be repaired by him free of charge.

All work scheduled to be removed or taken out shall be deemed to include the cleaning and preparation of the remaining sections, areas, or work to receive the new material or work specified.

Corrective maintenance work shall also include all cutting, grinding, cutting into, welding, bending, strengthening, drilling, etc to repair or to improve the items or areas as new and to match the existing.

Work scheduled to be realigned and re-fixed shall be deemed to include all necessary new additional materials, brackets, connector plates, bolts, pip rivets, nails, screws, spacer blocks, clamps, timber, and labour, etc to leave the items as new and totally functional.

Unless scheduled otherwise, new ceilings and ceilings in patchwork shall be fixed to existing brandering and the Contractor must take special care not to damage the existing brandering when removing damaged ceiling boards.

All new work are measured net and shall include all cutting, lapping, waste, bending, fixing, corners, mitres, fixing screws, pip rivets, nails, adhesive, grout, putty, etc, as well as cleaning and preparation of surfaces not already prepared as part of removed items, etc. The supply and installation of new window handles, pegs, stays, etc as well as the service of windows shall include for sealing all bolts and screws of handles, stays, etc with epoxy after fixing or tightening into positions.

The removal of doors, gates or windows shall include for the removal of all existing locks, handles, striking plates, etc but exclude the hinges, etc, which shall be used for the new replaced items. All servicing work (excluding paintwork) around and in the thresholds of new door frames, gates or windows build into existing brickwork in new or existing positions shall be deemed to be included in either the rates tendered for the new replacement item or the removal payment item of the frame, window, etc.

All ironmongery installed on the project shall bear the SANS approved trademark and codes. Samples of all ironmongery scheduled must be according to the samples of the Department of Public Works and samples must be handed to the engineer for approval before ordering the material.

Tilework to walls shall include all cutting, spacers, waste, jointing, mitres, corners, epoxy grout and joint filler.

All new glass mirrors shall be silvered float glass copper backed mirrors with polished edges all round and shall, unless otherwise scheduled, be fixed to walls with chromium plated dome capped mirror screws with rubber buffers.

Floors shall mean the scope of work to service and maintain materials and components such as removal of existing floors and installation of new floor coverings, skirtings, screeds, concrete floors and paving. This specification does not include work related to metalwork and paintwork, which are specified elsewhere.

All floors surfaces scheduled to be cleaned and sealed shall include for stripping the floors from any fats, grime, dirt, oil and other deposits. Replacement of grout to ceramic and clay floor tiles shall also be included where necessary as per the tendered rate.

Application of all paints must be supported by the relevant paint manufacturer's technical quality control systems with regard to preparation, application, film thickness, colour/pigmentation, mixing, etc.

All paint shall be delivered to the site in the unopened containers on which the manufacturer's name and trademark appear.

All materials for paintwork shall comply with the requirements for standards from the country from which it originated and shall be approved by the Engineer.

The coating system shall be from one manufacturer unless otherwise specified. The paint manufacturer's instructions shall be strictly adhered to.

Paints, etc, shall be suitable for application on the surfaces on which they are to be applied and various coats must be compatible with each other. Those paints used externally shall be of exterior quality or suitable for exterior use.

All existing finishings, carpets, floors, furniture, etc shall be carefully handled, moved when instructed within the specific room, building or area to be painted, covered with sheets, screens or other approved methods to protect the items or finishings against damage or spilled paint spots or stains. Any damage caused to the mentioned existing items shall be rectified or replaced by the Contractor without additional payment.

The costs of sheets, covers, screens and all labour to address the above shall be deemed to be included in the tendered rates for the individual payment items or in the general preliminary cost items. No claims by the Contractor in this regard will be entertained.

B 04 MEASUREMENT AND PAYMENT

BA ROOF COVERINGS

BA.01 **Supply and install cladding and sheeting:** ..... **Unit: m^2**

The area measured will be that of the exposed surface of the finished building as specified in, Subclause 8.1.1 of SANS 1200 HB and PW371.

Separate items will be scheduled for roof sheeting and side cladding, subdivided for each type of sheeting, cladding and finish, each profile and straight or curved sheets.

The rate shall cover the cost of removing the existing damaged sheeting, supplying, delivering, storing on Site, handling, moving, installing and fixing the sheeting or cladding complete with all necessary fasteners (all sheeting, cladding and accessories are to be supplied by a South African based manufacturer and are subject to a three year written guarantee for water tightness and workmanship). The rate shall also cover the cost of cutting, notching, waste, all scaffolding, temporary supports, hoisting facilities and safety precautions (see Subclause 8.1.1 of SANS 1200HB).

BA.02 **Supply and install sundry items, etc:** ..... **Unit: m**

Flashing, ridging, etc will be measured by length.

Separate items will be scheduled for each type, finish and shape of sundry item.

The rate shall cover the cost of removing existing damaged items, supplying, delivery, storing on Site, handling, moving, installing and fixing the relevant item complete with all fasteners and sundry items as stipulated.

The rate shall also cover the cost of cutting, notching, waste and of all scaffolding, temporary supports, hoisting facilities and safety precautions (see Subclause 8.1.1 of SANS 1200 HB) and PW371.

Anodised aluminium door handles shall be type B3083.
Chromium plated Cupboard pull handles with push button lock (ART 5174)
WC Indicator bolt, equipped with emergency release type B3631

BA.03 **Supply and install rainwater goods:** ..... **Unit: m**

Rainwater goods and similar lengths of constant profile will be measured by length.

Sundry items such as stop-ends, bends, shoes, etc are deemed to be included in the tendered rate per metre.

The rate shall cover the cost of removal of existing, supplying, delivery, storing on Site, handling, moving installing and fixing the relevant goods complete with all necessary fasteners, etc (all complete and subject to a three year written guarantee on water tightness and workmanship). The rate shall also cover the cost of cutting, notching and waste, and of all scaffolding, temporary supports, hoisting facilities and safety precautions (see Subclause 8.1.1 of SANS 1200 HB).

BA.04 **Roof rehabilitation:** ..... **Unit: m^2**

The area measured will be that of the exposed surface of building as specified in Subclause 8.1.1 of SANS 1200 HB.

The rate shall cover the cost for inspecting, removing existing and supplying and fixing new Leak King or *posidrive* screws and mechanisms, sealants, sealer strips, etc complete.

The rate shall also cover the cost of cutting, waste, all scaffolding, temporary supports, etc all to the approval of the Engineer.

BA.05 **Re-align gutters and down-pipes:** ..... **Unit: m**

The length measured will be that of the exposed length of finished building.

No separate items will be scheduled for size, thickness, material, profile, galvanized or Chromadek finished items.

The rate shall cover the cost of re-aligning and re-sealing joints of existing rainwater goods inclusive of brackets and sundry items from timber or steel purlins and trusses, the cost of any scaffolding, temporary supports, hoisting facilities etc.

BA.06 **Miscellaneous items:**

(a) Measured by number:

(i) (Description of item) ..... Unit: No

(ii) Etc.

(b) Measured by linear metre:

(i) (Description of item) ..... Unit: m

(ii) Etc.

(c) Measured by area:

(i) (Description of item) ..... Unit: m^2

(ii) Etc.

The unit of measurement shall be the number or metre or area as applicable to each item.

The tendered rates shall include full compensation for removal of existing, manufacturing or providing and installing each item complete as specified.

BB CARPENTRY AND JOINERY

BB.01 Structural timber:

(a) Brandering (sizes indicated)..... Unit: m

(b) Purlins (sizes indicated) ..... Unit: m

The unit of measurement shall be the metre of individual types of timber elements or number of complete trusses installed.

The tendered rates shall include full compensation for the removal of existing, supply of all materials, manufacture, cutting, waste, jointing, scaffolding, temporary supports, hoisting facilities, removal of redundant material / components and installation of the timber as specified.

BB.02 Ceilings:

(a) Ceiling boards, trapdoors, cornices, cover strips, etc (type and/or thickness indicated):

(i) Thickness, shape and description of applications ..... Unit: m^2, m, number

The unit of measurement shall be the number, metre or square metre of ceiling boards, trapdoors, cornices, etc replaced complete as specified and scheduled.

The tendered rates shall also include full compensation for the corrective maintenance actions of the ceilings, trapdoors, cornices, cover strips, removal of redundant material, etc including jointing strips, insulation blankets and brandering as specified.

BB.03 Joinery:

(a) Items measured by linear metre:

(i) Fascias, barge boards, rails, cover strips, quadrant beads, etc (size indicated) Unit: m

(ii) Etc for other items measured by length

The units of measurement shall be the number, metre or square metre of each type and/or size of joinery item specified and installed complete.

The tendered rates shall include full compensation for the removal of existing, supply of all materials, manufacture, cutting, waste, fixing, scaffolding, temporary supports, hoisting facilities and installation of the joinery items.

BD **WALLS, DOORS AND WINDOWS**

BD.01 **Doors and windows:**

(a) (Type of doors, windows, locks, etc and material indicated):

(i) Description of item..... Unit : number

The unit of measurement shall be the number of doors, windows, locks, etc replaced complete as specified.

The tendered rates shall include full compensation for the removal of existing, manufacturing and installation of the doors, windows, locks, frames, etc complete with hinges, handles, locks, barrel bolts, retaining devices, door stops, stays and any other work necessary to complete the work as specified. The tendered rates for windows shall also include full compensation for glazing, window sills and damp-proof sheeting as specified or to match existing.

BD.02 **Ironmongery, steelwork, glass, wall finishings, etc:**

(a) Measured by number:

(i) (Description of item) ..... Unit: number

(b) Measured by linear metre:

(i) (Description of item) ..... Unit: m

(c) Measured by area:

(i) (Description of item) ..... Unit: m^2

The unit of measurement shall be the number, metre or square metre as applicable to each item.

The tendered rates shall include full compensation for removal of existing, manufacturing, providing and installing each item to new or existing steel, wood or plaster complete as per specifications as scheduled or as the existing and shall include for all labour, material, waste, plant, transport, delivery, access, scaffolding, fuel, etc to the Engineer's approval.

BD.03 **Servicing and Cleaning of existing equipment:**

(a) Measured by number:

(i) (Description of item) ..... Unit: number

The unit of measurement shall be the number as applicable to each item.

The tendered rates shall include full compensation for complete servicing and cleaning of existing equipment as per manufacturers specification to the Engineer's approval.

BE **FLOORS**

BE.01 **Floor tiling and finishes, etc:**

(a) Measured by number:

(i) (Description of item) ..... Unit: number

(b) Measured by linear metre:

(i) (Description of item) ..... Unit: m

(c) Measured by area:

(i) (Description of item) ..... Unit: m^2

The unit of measurement shall be the number, metre or square metre as applicable to each item.

The tendered rates shall include full compensation for removal of existing, manufacturing, providing and installing each item complete as per specifications or as the existing and shall include for all labour, material, waste, plant, transport, delivery, access, scaffolding, fuel, etc to the Engineer's approval.

BE.02 **Servicing and Cleaning of Floors:**

(a) Indicate if servicing, alterations, removal of stains or sealing, etc:

(i) Description of individual items to be repaired, altered, removed, sealed, etc ..... Unit: m^2, m, number

The unit of measurement for items cleaned, altered, removed, sealed, etc shall be square metre, metre or number as scheduled.

The tendered rates shall include full compensation for all costs to clean, refix, remove, cutting into, realign, taking off, temporary store, etc as specified in the Standard and Technical Specifications and shall allow for all necessary labour, plant and new material needed to leave the scheduled items as new and to the approval of the Engineer.

TECHNICAL SPECIFICATION

CA ROADS

CONTENTS

CA 01 SCOPE

This specification covers the materials, equipment, methods, testing and work required for the maintenance of existing roadways, parking areas, miscellaneous areas subjected to vehicular traffic and other miscellaneous paved areas. It covers both surfaced and un-surfaced roadways and includes appurtenant works such as kerbing, road markings and road signs.

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

CA 02 STANDARD SPECIFICATIONS

CA 02.01 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:

PW 371	-	Specification of Materials and Methods to be used, fourth edition, October 1993
SANS 1200 D	-	Earthworks
SANS 1200 DM	-	Earthworks (roads, subgrade)
SANS 1200 M	-	Roads (general)
SANS 1200 MJ	-	Segmented paving
SANS 1200 MM	-	Ancillary roadworks
COLTO	-	Standard specifications for Road and Bridge Works

CA 03 EXECUTION OF MAINTENANCE WORK

CA 03.01 GENERAL

All maintenance work shall be executed using approved materials and equipment suitable to the systems and/or installations they serve.

All materials and equipment shall comply fully with the requirements as specified for each installation.

The said maintenance work shall be executed in accordance with the relevant codes of practice, standards, regulations, municipal laws and by-laws, manufacturer's specifications and codes of practice and all additional and particular specifications included in this document.

Maintenance items for the existing roadways, parking areas, miscellaneous areas subject to vehicular traffic and other paved areas shall be categorised under the following headings:

(a) Repair of gravel wearing course
(b) Surface repairs of concrete pavements
(c) Repair of Segmented Paving
(d) Erection and repair of permanent road traffic signs and traffic-control devices
(e) Road markings
(f) Chemical control of vegetation and eradication of undesirable vegetation.

CA 03.02 MAINTENANCE OF GRAVEL WEARING COURSE

This section covers the maintenance of an existing gravel wearing course over part of or over the full road width.

CA 03.02.01 Construction

The Engineer will demarcate any areas to be repaired, and shall instruct the Contractor with regard to the maintenance work to be done.

The reshaped wearing course shall be constructed true to line, level and cross-section as shown as directed by the Engineer.

The reshaping process shall in general be carried out using the existing wearing course. This material shall be graded to form the correct road profile. If necessary, the Engineer shall instruct the Contractor to rip, redistribute and recompact the wearing course in order to achieve the correct road profile.

Unsuitable or excess material from the road prism shall be removed from the site of to spoil. Any shortfall in material shall be made up by importing suitable material.

Material which is ripped or imported shall be placed, watered, mixed and compacted to a minimum of 93% of modified AASHTO density.

The Contractor's attention is specifically drawn to the requirement that only material approved by the Engineer may be imported.

During the reshaping process, the roadside drains and cut and fill slopes shall be trimmed and finished true to line, level and cross-section. No additional payment will be made for trimming and finishing of cut and fill slopes.

CA 03.02.02 Quality standard

The gravel wearing course shall be constructed true to line, level and cross-section as shown on the drawings or as directed by the Engineer.

CA 03.02.03 Materials

The materials shall comply with SANS 1200 ME and the additional requirements detailed below:

Additional material requirements for wearing course - natural gravel

Maximum size	37,5 mm
Oversize index (I_o)[a]	≤ 5 per cent
Shrinkage product (S_p)[b]	100 - 365 (maximum of 240 preferable)
Grading coefficient (G_c)[c]	16 - 34
CBR: ≥ at ≥ 95 per cent modified AASHTO compaction and OMC[d]	

a) I_o = Oversize index (per cent retained on 37,5 mm sieve)
b) S_p = Linear shrinkage x per cent passing 0,425 mm sieve
c) G_c = (Per cent passing 26,5 mm - per cent passing 2,0 mm) x per cent passing 4,75 mm/100
d) Tested immediately after compaction

CA 03.03 SURFACE REPAIRS OF CONCRETE PAVEMENTS

This section covers the repair of spalled concrete at joints, the forming and sealing of new joints and the sealing or resealing of existing joints and the patching of existing concrete.

CA 03.03.01 Construction

Patching, resealing of joints and sealing of cracks in concrete pavements shall be done at the positions indicated by the Engineer.

(a) Resealing of joints and cracks

(i) Preparation of joints for resealing

The old deteriorated sealant in the top of the joint to be resealed shall be cut or scraped loose from each joint face with equipment that will not damage joint edges or the concrete surface. Care shall be taken not to damage, spall or bevel the joint edges.

The joints shall be initially cleaned to the full depth of the old sealant plus its backing material, as well as of all foreign material in the joints. A vacuum process, and not compressed air, shall be used to remove all loosened material from the joints. The Contractor shall continuously remove debris from the road surface and keep the surface clean. After the removal of the old material has been completed, refacing of the joint planes shall be done with an abrasive wheel or a power-driven concrete saw to widen each face of the sealant reservoir portion of the joint by a minimum of 2,0 mm and a maximum of 5,0 mm. No sealant may be applied to other than freshly cut concrete faces. The freshly cut concrete faces shall be degreased to such extent that adhesion of the sealant to the concrete in every respect satisfies the sealant manufacturer's guarantee.

Immediately after the sawing operation, the joint grooves shall be thoroughly vacuumed and washed out with a jet of clean water to remove all remaining loose material resulting from the sawing operation. Any slurry resulting from the wet sawing shall be removed from the road surface.

Sweeping up old joint material and other debris with hand brooms shall be a continuous process during joint preparation. The joints shall be finally cleaned again prior to resealing, but in no case shall the cleaning precede the sealant by more than 30 m of joint length.

(ii) Preparation of cracks for sealing

Sealing shall be considered only for cracks that are open wide enough to permit entry of joint sealant or mechanical routing tools. The decision of whether a crack is to be sealed or not shall rest with the Engineer. Sealant in previously sealed cracks shall be removed as described above.

A groove of at least 12 mm wide by 18 mm deep shall be made along the crack with a machine capable of closely following the path of the crack without causing excessive spalling or other damage to the adjacent concrete. Cleaning of the cracks after the grooving operation shall be done as described above.

(b) Patching of concrete

Patching of concrete shall be done where indicated by the Engineer.

Unless otherwise instructed by the Engineer, the patching shall have a neat rectangular shape with sides parallel to existing joints. The concrete within the area to be patched shall be broken up and removed to its full depth. The vertical face of the existing concrete adjacent to the patch shall be planed with an abrasive wheel or power-driven concrete saw, if necessary, to provide a smooth face.

Immediately prior to the placing of new concrete, the surface of the underlying pavement layer shall be compacted with either hand or mechanical equipment, depending on the space available, to ensure a firm foundation surface.

An isolation joint shall be constructed between all interfaces of existing and new concrete. The isolation joint shall consist of a joint filler, a bond breaking strip and a polysulphide sealant. The isolation joint shall only be sealed between 21 and 28 days after the casting of the concrete, at which time the uppermost portion of the joint filler shall be raked out, the bond breaking strip inserted and the polysulphide sealant applied.

As the patching of concrete will generally occur in trafficked areas, the Contractor shall allow fully in the relevant rates for accommodation of traffic to enable safe construction conditions. No additional payment will be made over and above the tendered rates for the work.

No traffic shall be allowed over concrete patches for a period of seven (7) days after casting.

CA 03.03.02 Materials

(a) Polysulphide sealant

The polysulphide sealant shall be a two-component material that complies with the requirements of SANS 110.

(b) Additional materials for polysulphide sealant

The sealant shall be supported by a bond breaker backing strip, and, unless otherwise recommended by the manufacturer and approved by the Engineer, the faces of the joint groove shall first be treated with a primer.

Supporting and priming materials shall be compatible with adjacent materials or surfaces in contact with the materials and shall be in accordance with the manufacturer's recommendations and subject to approval by the Engineer.

Primers, bond breakers and back-up material shall comply with instructions and recommendations issued by the manufacturer of the approved liquid sealant used.

CA 03.03.03 Quality standard

Surface repairs shall be executed and finished strictly in accordance with the prescribed requirements.

Maintenance work shall be carried out in such a manner as to blend in colour, texture and finish with adjacent concrete surfaces as far as possible.

CA 03.04 MAINTENANCE OF SEGMENTED PAVING

This section covers the replacement of an existing area of segmented paving as well as the reprocessing and/or replacement of the underlying pavement layers.

CA 03.04.01 Construction

The Engineer will demarcate any areas to be repaired and shall instruct the Contractor with regard to the maintenance work to be done.

The demarcated area shall be repaired true to line, level and cross-section as shown on the drawings or as directed by the Engineer.

The demarcated area of damaged segmented paving shall be removed. Unless otherwise instructed by the Engineer the pavement layers shall be reinstated as follows:

1. Selected layers shall be of at least a G5 quality and shall be compacted to at least 93% of modified AASHTO density.

2. Material for the subbase layers shall be stabilized with 3% cement and compacted to 95% of modified AASHTO density, and shall be of at least a G5 quality.

3. The material for the base layer shall be stabilized with 5% cement and compacted to at least 97% of modified AASHTO density, and shall be at least a G3 quality.

Pavement layers of segmented paved areas under pedestrian traffic only, shall be excavated and replaced by natural gravel compacted to 93% modified AASHTO density. Damaged concrete edge beams and intermediate beams shall be replaced with class 30 concrete edge beams and intermediate beams similar in dimension to

existing undamaged edge beams and intermediate beams in accordance with the relevant SANS specifications or as directed by the Engineer. After the repair of the underlying pavement layers and when the concrete edge beams and intermediate beams have reached sufficient strength, segmented paving blocks, similar to the existing undamaged segmented paving blocks shall be replaced in accordance with the relevant SANS specifications or as directed by the Engineer.

Unsuitable or excess material shall be removed from the site of to spoil. Any shortfall in material shall be made up by importing suitable material.

CA 03.04.02 Quality standard

The repaired segmented paving shall be constructed true to line, level and cross-section as shown on the drawings or as directed by the Engineer.

CA 03.05 ROAD TRAFFIC SIGNS

CA 03.05.01 General

This section covers the maintenance of permanent road traffic signs. It includes the replacement of faded, damaged or not clearly visible existing signboards and reference marker boards.

The signs shall be the standard regulatory, guidance, warning and information signs and fabricated in accordance with the South African Road Traffic Signs Manual (July 1993) except where otherwise specified, indicated on drawings or directed by the Engineer.

The erection and placement of any signs, whether temporary or permanent, shall be in accordance with the South African Road Traffic Signs Manual (June 1999).

CA 03.05.02 Storage and handling

All road signs or parts of road signs shall be transported, handled and stored in a weather-proof storeroom in such a manner as to prevent any damage and deformation.

Sign boards shall be stored on blocks in the vertical position so that the signs are not in contact with the ground. There shall be sufficient space between the finished road sign boards to permit free air circulation and moisture evaporation. Contact of road sign boards with treated timber and diesel, or storage where road sign boards come into contact with dirt or water will not be permitted.

When required, existing or newly erected road signs shall be fully or partially covered with burlap or other approved adequately ventilated material to obscure destinations that are temporarily inapplicable or irrelevant. The covers shall be neatly and firmly fixed in position so that they will be able to withstand strong gusts of wind or eddies caused by passing traffic. The fixing shall be done in a way that will not cause any damage to the road sign face.

CA 03.05.03 Execution of the work

(a) Position

Road signs shall be erected in the positions shown on the drawings or indicated by the Engineer.

(b) Excavation and backfilling

Excavations for the erection of road signs shall be made according to the dimensions shown on the drawings. Where the excavations are to be backfilled with soil, a 1:12 cement/soil mixture (soilcrete) shall be prepared if instructed by the Engineer. The soil or soil-cement mixture shall then be placed at optimum moisture content in 100 mm thick layers in the excavation and shall be compacted to a minimum of 90% of modified AASHTO density.

Where posts or structures are to be fixed in concrete, or where concrete footings are to be cast, the concrete, formwork and reinforcement shall comply with the relevant requirements. The holes shall be completely filled with concrete up to the level shown on the drawings or indicated by the Engineer. The upper surface of the concrete shall be neatly finished with sufficient fall to ensure proper drainage.

This subclause shall apply to ground-mounted signs only. Excavating and backfilling for the foundations of overhead steel structures are specified and regarded as specialised structural work.

(c) Erection

Road sign boards must be inspected by the Engineer and approved in writing before the boards are taken from the camp site to the erection site. The Contractor shall notify the Engineer at least one (1) week before the said inspections are required.

Road signs shall be erected strictly in accordance with the details and instructions on the drawings and as directed by the Engineer.

During erection the structural steelwork shall be firmly bolted and protected to prevent buckling or damage being caused during erection, or by the equipment used for erection.

Posts to which road signs are to be fixed shall be vertical and the undersides of road signs shall be horizontal after having been erected.

Any sign damaged during transit to the erection site or during the erection process shall be replaced or repaired to the satisfaction of the Engineer at no extra cost to the Employer.

(d) Field welding

All welding done during erection shall comply with the requirements for welding during manufacture.

CA 03.06 ROAD MARKINGS

CA 03.06.01 General

This section covers the permanent marking and maintenance of white, yellow or red painted lines or symbols on the road surface by specialist contractors.

CA 03.06.02 Materials

(a) Plant

(i) Road-marking paint

Road-marking paint shall comply with the requirements of SANS 731-1 for type 1, type 2 or type 4 paint.

The paint shall be delivered at the site in sealed containers bearing the name of the manufacturer and the type of paint. Marking shall be in accordance with SANS 731-1.

The viscosity of the paint shall be such that it can be applied without being thinned down.

(ii) Retro-reflective road-marking paint

Retro-reflective road-marking paint shall comply with the requirements of CKS 192 and SANS 731-1.

(iii) Colour

The colours to be used shall be bright white, yellow or red.

The colour of the yellow and red paint shall be as specified in SANS 731-1.

(iv) Retro-reflective beads

The retro-reflective beads shall be glass beads that comply with the requirements for glass beads specified in CKS 192.

The beads shall be delivered at the site in sealed bags, marked with the name of the manufacturer, the batch number and an inspection seal of the South African Bureau of Standards (SANS), confirming that the beads form part of a lot that has been tested by the SANS and complies with the requirements of CKS 192. If not, the Contractor shall at all times have an SANS certificate on the site, with details of the batches that make up a lot that has been tested by the SANS, complies with CKS 192 and to which the inspection seal applies.

CA 03.06.03 Weather limitations

Road-marking paint shall not be applied to a damp surface or at temperatures lower than 10 °C, or when, in the opinion of the Engineer, the wind strength is such that it may adversely affect the painting operations.

No road-marking paint may be applied when visibility is dangerously impeded by mist, smoke or smog.

CA 03.06.04 **Surface preparation**

Before the paint is applied, the surface shall be clean and dry and completely free from any soil, grease, oil, acid or any other material that will be detrimental to the bond between the paint and the surface. The surface where the paint is to be applied shall be properly cleaned by means of watering, brooming or compressed air if required.

Particular care shall be taken to ensure that the surface shall be clean, where roadstuds are to be fixed.

The Contractor shall take note of conditions which he is unable to rectify by himself and may effect the durability of the paint, and he shall point out these conditions to the Engineer in writing. Disputes arising from such conditions shall be referred to the relevant Regional Engineer for arbitration before road marking commences.

The Contractor shall protect the retro-reflective surfaces of roadstuds when paint is applied and remove the protection immediately after the paint has been applied.

On concrete and bituminous surfaces where polished aggregate is exposed, a tack coat shall be used. On new concrete surfaces any laitance and/or curing compound shall be removed before the markings are applied.

The material shall not be laid over loose debris, mud or similar extraneous matter or over old flaking markings of paint or thermoplastic material. If the road surface is at a temperature of less than 5 °C, or if it is wet, it shall be warmed carefully by a road heater so that, when the material is laid, the surface temperature is above 5 °C and the surface dry.

CA 03.06.05 **Setting out the road markings**

The lines, symbols, figures or marks shall be premarked by means of paint spots of the same colour as that of the final lines and marks. These paint spots shall be at such intervals as will ensure that the traffic-markings can be accurately applied, and in no case shall they be more than 1,5 m apart. Normally spots of approximately 10 mm in diameter should be sufficient.

The dimensions and positions of road-markings shall be as indicated by the Engineer, specified in the appropriate statutory provisions and the South African Road Traffic Signs Manual.

After spotting, the positions of the proposed road markings such as broken lines and the starting and finishing points of barrier lines shall be indicated on the road. These premarkings shall be approved by the Engineer prior to commencement of any painting operations.

The position and outlines of special markings shall be produced on the finished road in chalk and shall be approved by the Engineer before the markings are painted. Approved templates may be used on condition that the positioning of the marking is approved by the Engineer before painting is commenced.

CA 03.06.06 **Protection**

After the paint has been applied, the road markings shall be protected against damage by traffic or other causes. The Contractor shall be responsible for erecting, placing and removing all warning boards, flags, cones, barricades and other protective measures that may be necessary in terms of any statutory provisions and/or as may be recommended in the South African Road Traffic Signs Manual and specified in Road Note 13.

CA 03.07 CHEMICAL CONTROL OF VEGETATION AND ERADICATION OF UNDESIRABLE VEGETATION

CA 03.07.01 General

This section covers the eradication of declared and undesirable vegetation, as well as the chemical control of vegetation growth through the application of herbicide.

CA 03.07.02 Execution of work

The eradication of undesired vegetation and chemical control of vegetation growth shall be executed where directed by the written instruction of the Engineer.

Herbicide shall normally only be applied in the spring or summer during the period when the vegetation to be killed is growing strongly.

The Contractor's attention is drawn to the requirement that herbicides may only be applied by duly registered, competent contractors in possession of an AVCASA certificate. Proof of such registration shall be furnished on demand to the Engineer.

The Contractor shall ensure that no damage is caused to other plants inside or adjacent to the treated areas as a consequence of the application of herbicides.

Application shall not be carried out in high winds or wet weather.

The following herbicides may not be used:

- Agents of an explosive, flammable, volatile or corrosive nature
- Sodium chlorate
- Volatile low hormone type herbicides
- Agents which are not registered in the Republic of South Africa.

The Contractor shall state the brand name of the herbicide on which the tendered rate is based, which shall be subject to the approval of the Engineer, prior to the application thereof.

The agent shall be guaranteed to kill at least 90% of the unwanted growth with one application and shall have a residual effect which controls the growth of such vegetation effectively for one growing season.

The herbicide should be strictly applied at the rate recommended by the manufacturer.

(a) Chemical control of vegetation growth

Subject to written approval by the Engineer beforehand, spraying shall be executed in the following designated areas:

(i) Shoulder weedspray shall comprise the spraying of a 300 mm wide strip of herbicide directly adjacent to the road shoulder. The spraying of shoulders may take place only after the shoulder strips have been cut.

(ii) Where vegetation is encroaching onto the road shoulder an increased width of 500 mm shall be sprayed along the edge with 200 mm on the black top surface and 300 mm on the shoulder vegetation.

(iii) Vegetation under guard-rails shall be controlled by spraying under the guard-rail to a width of 500 mm;

(iv) Openings, cracks and joints between the road pavement and concrete, as well as between paving stones and concrete blocks –

shall be measured only for the area between joints, cracks or openings treated;

(v) Up to a maximum distance of 500 mm around the poles at kilometre markers, road signs and guard-rail posts;

(vi) Between the road reserve fence and a neighbouring solid wall. Here the Contractor may use only contact herbicides which are absorbed by the leaves and which do not have a detrimental effect on the soil;

(vii) Entire areas invaded by weeds; Where interlocking paving areas are to be treated, a quantity of one third (1/3) of the entire surface shall be measured for payment.

The type of herbicide to be used, the correct spray rate, the method of application and when applied, shall be as specified in the Particular Specifications.

(b) The eradication of weeds

The eradication of declared and undesirable vegetation shall take place in the road reserve during the contract period over the whole length of the sections of road involved, and may include localised patches of noxious weeds, invader plants and other undesired vegetation.

The Contractor shall ensure that no damage whatsoever is caused to any plants inside or adjacent to the areas treated as a consequence of the application of the herbicides, either during or after application. This also includes areas outside the road reserve.

The type of weed killer to be used, the correct application rates and when applied, shall be as specified and according to the manufacturer's instructions.

CA 04 MEASUREMENT AND PAYMENT

CA.01 MAINTENANCE OF GRAVEL WEARING COURSE

CA.01.01 Reshaping the wearing course by:

(a) Grading only ..... Unit: square metre (m^2)
(b) Ripping, redistributing and compacting ..... Unit: square metre (m^2)
(c) Importing, placing and compacting material from commercial sources ..... Unit: cubic metre (m^3)

The unit of measurement for CA.01.01 (a) and (b) shall be the square metre surface area graded or ripped and recompacted to a depth of 150 mm, as instructed by the Engineer.

The unit of measurement for CA.01.01 (c) shall be the cubic metre of compacted material imported from commercial sources as instructed by the Engineer and measured in place.

The tendered rates shall include full compensation for providing all plant, labour, equipment and materials required and for reshaping and/or constructing the wearing course as instructed by the Engineer. The tendered rates shall also include full compensation for the cost of testing to ensure the finished wearing course complies with the specified requirements.

CA.02 SURFACE MAINTENANCE OF CONCRETE PAVEMENTS

CA.02.01 Preparation and resealing of joints in existing concrete pavements:

(a) Expansion joints or construction joints ..... Unit: metre (m)

The unit of measurement shall be the metre of each type of joint prepared and sealed or resealed.

The tendered rates shall include full compensation for all labour plant, equipment, tools and materials, removing old sealant, backing material and any foreign material, refacing or enlarging the faces by sawing, routing of cracks to the specified dimensions, disposing of all debris, all cleaning work involved, installing back-up material where required, installing the bond breaker, applying the primer and mixing and applying the sealant, ensuring acceptable bond with existing work, and for any other operation needed to complete the work as specified.

CA.02.02 Patching of concrete:

(a) Thickness stated ..... Unit: square metre (m^2)

The unit of measurement shall be the square metre of concrete replaced.

The tendered rates shall include full compensation for all the necessary labour, plant, equipment, tools and materials required for breaking out the existing concrete, disposing of the debris, compacting the exposed pavement layer, supplying, placing and finishing off the new concrete, and constructing isolation joints. The tendered rates shall also include full compensation for providing adequate accommodation of traffic where necessary. No separate payment shall be made for breaking out the existing concrete, sealing the joints and disposing of material removed.

CA.03 SEGMENTED PAVING

CA.03.01 Corrective maintenance of segmented concrete block paving ..... Unit: square metre (m^2)

The unit of measurement shall be the square metre completed segmented concrete block paving removed, material excavated from the existing pavement to a depth of 400mm, backfilling, stabilising and compacting layers of 150mm, supply of bedding sand, and installation of new concrete block paving similar to existing.

The tendered rate shall include full compensation for demarcating the excavation and excavating and disposing of the material, backfilling and stabilising material, compaction, bedding sand and concrete block paving.

CA.03.02 Replacement of jointing sand ..... Unit: square metre (m^2)

The unit of measurement for the replacement of jointing sand shall be square metre of existing paving area treated.

The tendered rate shall include full compensation for supplying, delivering, placing, and spreading of jointing sand, brooming into joints, compacting using a plate compactor as specified and removal of excess sand from the pavement. The tendered rate shall also include full compensation for all labour, transport, incidentals and equipment required to perform the work according to the specifications.

CA.04 ERECTION AND REPAIR OF PERMANENT ROAD TRAFFIC SIGNS

CA.04.01 Reinstatement of road sign boards

(a) Area not exceeding 2 m^2 .....Unit: square metre (m^2)

The unit of measurement shall be the square metre of completed road sign erected.

The tendered rates shall include full compensation for attaching the road signboard to a road sign support structure and for all equipment, labour, supervision, nuts, bolts, transport, handling, etc, necessary for the installation of the road sign board.

CA.04.02 Road sign supports

(a) Steel tubing of (76 mm diameter and 3 mm wall thickness)..... Unit: metre (m)

The unit of measurement for CA.07.02(a) for erecting supporting structures manufactured from steel tubing shall be the metre of steel tubing used. Bolts and other accessories shall not be measured.

The tendered rates shall include full compensation for excavation, stabilised backfilling, concrete, erecting the road sign supports, including all bolts, screws, rivets, welding and accessories, together with the painting and galvanizing required and the provision and treatment of breakaway holes in timber supports.

The tendered rates shall also include full compensation for tying up, clearing, trimming, disposing of material at approved dumping sites provided by the Contractor, and finishing the area around each sign footing.

CA.05 ROAD MARKINGS

Retro-reflective road-marking paint

(a) Longitudinal lines:

(i) 100 mm – 150 mm wide broken or unbroken lines, white, yellow or red ..... Unit: metre (m)

(b) Transverse lines and other markings:

(i) Lettering and symbols, white or yellow, repainting existing markings .....Unit: square metre (m^2)

The unit of measurement for subitem CA.10.01(a) shall be a metre of line of each specified width of line, for widths not exceeding 150 mm, and the quantity paid for shall be the actual length of line painted in terms of an official order, measured to the nearest metre. The length of gaps in broken lines shall not be measured for payment.

The unit of measurement for subitem CA.10.01(b) shall be a square metre and the quantity to be paid for shall be the actual surface area of the lettering, symbols, traffic island markings or lines completed in terms of an official order, measured to the nearest tenth of a square metre.

The tendered rate per metre or per square metre, as the case may be, shall include compensation for procuring and providing all the necessary labour, constructional plant, tools, equipment and materials, including the retro-reflective beads. The tendered rate shall also include full compensation for surface preparation, for painting the road markings and applying the retro-reflective beads, for protection and temporary traffic control facilities, maintenance, and for all incidentals necessary to complete and maintain the road markings in accordance with the provisions of the contract, including the setting-out of lettering, symbols and traffic island markings, but excluding setting out and premarking the lines.

CA.06 **CHEMICAL CONTROL OF VEGETATION AND ERADICATION OF UNDESIRABLE VEGETATION**

Chemical control of vegetation:

(a) 300 mm wide strip ..... Unit: kilometre (km)

(b) Area covered by interlocking blocks ..... Unit: square metre (m^2)

The unit of measurement shall be the kilometre or area of road treated as described in these specifications. The distance treated will be measured once for each strip so treated.

The tendered rate shall include full compensation for the supply of chemicals, plant, equipment and labour for the spraying of the chemical liquids in accord with the manufacturers specifications.

The tendered rates shall be fully inclusive of any costs arising from restricted working conditions due to the nature of the site or traffic flow.

TECHNICAL SPECIFICATION

CB STORMWATER DRAINAGE

CONTENTS

CB 01 SCOPE

This specification covers the materials, equipment, methods, testing and work required for the maintenance of existing stormwater drainage systems. It covers both surface and underground drainage systems.

CB 02 STANDARD SPECIFICATIONS

CB 02.01 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:

PW 371	-	Specification of Materials and Methods to be used (Fourth edition, October 1993)
SANS 1200 LE	-	Stormwater drainage

CB 03 EXECUTION OF MAINTENANCE WORK

CB 03.01 GENERAL

Maintenance items for the stormwater drainage systems shall be categorised under the following headings:

(a) Cleaning of prefabricated culverts;

(b) Cleaning of concrete drains and channels;

(c) Cleaning of pipelines.

CB 03.02 CLEANING OF PREFABRICATED CULVERTS

The work involved under this section is the removal of silt and debris from prefabricated culverts including the cleaning of inlet and outlet structures.

CB 03.02.01 Construction

Material removed from the culverts shall be disposed of where instructed by the Engineer. Rubble and waste material shall be disposed of at the nearest appropriate solid waste disposal site, unless otherwise directed by the Engineer.

The Contractor must ensure that all material being removed is removed before or at the nearest accessible downstream structure. No additional payment will be made for the removal of material which, as a result of cleaning operations, find its way into a previously clean section of the culvert network.

CB 03.02.02 Quality standard

Prefabricated culverts shall be cleaned of all silt and debris such that all surfaces are clearly visible and accessible for inspection.

All spoil material shall be spread neatly and shall not wash back into drainage trenches.

CB 03.03 CLEARING OF CONCRETE DRAINS AND CHANNELS

This section covers the work in connection with the removal of silt, debris and vegetation causing obstruction to flow in concrete drains and channels.

CB 03.03.01 Construction

Material removed from channels shall either be loaded and removed from the site or disposed of adjacent to channels where it cannot be washed back into the channel as directed by the Engineer.

Where material is spoiled adjacent to channels the Contractor shall ensure that the material is spread neatly and well clear of the top of the channels where it will not wash back. .

Vegetation growing in channel joints and cracks shall be removed with roots to prevent re-growth.

Vegetation growing over channels from the edges shall be slashed at the concrete edges and disposed of.

CB 03.03.02 Quality standard

Concrete drainage channels shall be clear of any obstruction such that the concrete surfaces are clearly visible.

CB 03.04 CLEANING OF PIPELINES

The work under this section involves the removal of silt and debris from pipelines, including the cleaning of inlet and outlet structures.

CB 03.04.01 Construction

Material removed from the pipes shall be disposed of where instructed by the Engineer. Rubble and waste material shall be disposed of at the nearest appropriate solid waste disposal site, unless directed otherwise by the Engineer.

The Contractor shall ensure that all material is removed at the nearest accessible structure. No additional payment will be made for the removal of material from previously cleaned sections of the network.

CB 03.04.02 Quality standard

Pipes shall be cleaned of all silt and debris.
All spoil material shall be spread neatly to ensure that it will not return to the drainage trenches.

CB 04 MEASUREMENT AND PAYMENT

CB.01 CLEANING OF PREFABRICATED CULVERTS

CB.01.01 Cleaning Prefabricated concrete pipes .....Unit: metre (m)

The unit of measurement shall be the metre of pipe or culvert cleaned, measured once along the soffit of the culvert.

The tendered rates shall include full compensation for removing the material off-site, for disposing of the material in an appropriate manner and ensuring that the material will not wash into drainage trenches.

CB.02 CLEANING OF CONCRETE DRAINS AND CHANNELS

CB.02.01 Cleaning of concrete drainage channels and side drains.....Unit: metre (m)

The unit of measurement shall be the metre of channel cleaned, measured once along the invert of the channel.

The tendered rates shall include full compensation for all labour and equipment required for removing the material from channels irrespective of the depth of silt and debris and for loading, off-loading and spreading. The tendered rates shall also include full compensation for the removal of vegetation in channels and growing over the edges of channels.

The tendered rates shall also include for transporting the excavated material to spoil sites.

TECHNICAL SPECIFICATION

CC FENCING

CONTENTS

CC 01 SCOPE

This specification covers the maintenance and servicing of fencing and gates.

This specification shall form an integral part of the repair and maintenance contract document and shall be read in conjunction with portion 3: Additional Specifications included in this document.

CC 02 STANDARD SPECIFICATIONS

CC 02.01 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:

SANS 121 - Hot-dip (galvanised) zink coatings (other than on continuously zinc-coated sheet and wire) (1988)
SANS 675 - Zinc-coated fencing wires (plain and barbed) (1993)
SANS 1373 - Chain-link fencing and its wire accessories (1983)

CC 02.02 OCCUPATIONAL HEALTH AND SAFETY 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 25207 and Regulation Gazette No 7721 of 18 July 2003 shall be adhered to.

CC 02.03 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.

CC 03.01 SCOPE OF WORK

The Ports of Entry consist of various sections of fencing, as listed in specification **SS: Site Specific Inventory**, which forms part of the maintenance and servicing contract for fencing, cleaning and site keeping.

CC 03.02 CLEARING THE FENCE ROUTE

The fence route shall be cleared over a width of at least 0,5m on *each side* of the centre line of the fence and surface irregularities shall be levelled so that the fence will follow the general contour of the ground.

Should the contractor consider the use of approved herbicides to control vegetation for the ease of future maintenance, *no separate payment shall be made in this regard.* The removal of trees or shrubs within the specified width interfering with the integrity of the fence *up to* a diameter of trunk of 200mm (measured 0,5m above ground level) shall be deemed included in the rate. Trees with trunk diameter in excess of 200mm shall be measured elsewhere. The bottom of the fence shall be located at a uniform distance above the ground line, but no more than 50 mm. The rate should also make provision for the placing, and compacting of small quantities of fill material should the surface irregularities be of such an extent that the 50mm restriction of fence above ground level can not be achieved.

CC 03.03 POSTS AND STANDARDS

Posts shall be accurately set in holes and be provided with concrete bases (included in the rate) to the dimensions specified.

Holes shall be dug to their full specified depth.

Posts shall be firmly planted into the ground (600mm minimum) at the same spacing as the existing posts or as instructed by the Engineer. The spacing of posts between any two straining posts shall be **uniform**.

CC 03.04 FENCE WIRES

All fencing wire shall be wired to the sides of posts in order to prevent the wires from being displaced or becoming loose. The wire shall be carefully strained and hung *without sag*, and with true alignment, care being exercised not to strain the wire so tightly that it will break or that end, corner, straining or gate posts will be pulled up.

Each strand of fencing wire shall be securely fastened in the correct position to each post with soft galvanised binding wire.

Splices in the fencing wire shall be permitted if made in the following manner using a splice tool. The end of each wire at the splice shall be carried at least 75 mm past the splice tool and wrapped snugly around the other wire for not less than six complete turns, the two separate wire ends being turned in opposite directions. After the splice tool is removed the space left by it in the splice wire shall be closed by pulling the wire ends together. The unused ends of wire shall be cut close so as to leave a neat splice.

CC 03.05 **DIAMOND MESH OR WELDED MESH**

Wire netting or diamond mesh shall be stretched against the fence and properly secured to the fencing wire. The diamond mesh or wire netting shall be secured by means of soft binding wire at 1,2 m centres along the top and bottom wires and at 3 m centres along each of the other fencing wires unless otherwise specified.

CC 03.06 **CLOSING OPENINGS UNDER FENCES**

At ditches, drainage channels or other hollows where it is not possible to erect the fence so that it follows the general contour of the ground, the Contractor shall cover the openings with wire netting or diamond mesh fixed to the fence.

CC 03.07 **EXISTING FENCES**

Where a new fence joins an existing fence, whether in line or at an angle, the new fence shall be erected with a new straining post positioned at the terminal of the existing fence.
Existing fences that requires to be taken down or removed to a new location shall be dismantled. Material not required for re-erection or declared unsuitable for re-use shall be neatly stacked at approved locations in accordance with the Engineer's instructions – and shall be removed by the contractor at his own cost.

CC 03.08 **GATES**

Gates shall be hung on gate fittings in accordance with the requirements specified. The gates shall be so erected that they swing in a horizontal plane at right angles to the gateposts, clear of the ground in all positions.

Double swing gates shall not leave a gap of more than 25 mm between them when closed and other gates shall not be further than 25 mm from the gate-post when closed. The clearance below the gates shall not exceed 75 mm with the gates closed.

CC 03.09 **FENCING MATERIAL**

All new material used to replace old material shall be similar to the old material replaced unless a new material is specified by the Engineer. In the event of a fence being replaced with a new fence, the removal- and disposal of all previous redundant material shall be deemed *included* in the rate for the new fencing material.

CC 04 **QUALITY STANDARD**

The completed fences shall be plumb, taut, true to line and ground contour, with all posts, standard and stays firmly set.

The Contractor shall, on completion of each section of fence, remove all cut-offs and other loose wire or netting so as not to create a hazard to grazing animals or a nuisance to the owners of the property.

CC 05 MATERIALS

CC 05.01 POSTS

Posts that need to be replaced shall be of the same type and size as the existing posts (or as specified by the Engineer). Tubular posts shall be *capped*, galvanised in accordance with SANS 763 for Class B1 articles as specified and have a minimum wall thickness of 2,00 mm and diameter of 110mm (or as approved by the Engineer). The replacement of a post shall include the removal of the old post as well as the concrete footing and disposing thereof as part of the rate. All new posts shall be founded in concrete as per DPW specification, and shall be deemed included in the rate. Tubular stays shall have a minimal bore of at least 60 mm and a wall thickness of at least 2,00 mm. These stays and posts shall be fully galvanised as specified In SANS 121.

CC 05.02 WIRE

CC 05.02.01 Barbed wire

Barbed wire shall comply with the requirements of SANS 675 and shall be:

(a) Mild-steel grade, double strand, unidirectional twist wire, each strand 2,50 mm diameter, for use at any height above ground. The wire shall be fully galvanised;

(b) Barbs shall be manufactured from 2,0 mm galvanised wire and shall be spaced at not more than 152 mm.

(c) High-tensile grade, oval shaped, single-strand wire, 3,15 mm x 2,50 mm (2,81 mm equivalent diameter), and fully galvanised

(d) High-tensile grade, oval shaped, single-strand wire, 2,80 mm x 1,90 mm (2,31 mm equivalent diameter), and fully galvanised (first class coating). The wire shall be fully galvanised.

CC 05.02.02 Barbed tape coil

Barbed tape coil shall comply with the requirements for type A in CKS 592 and shall consist of close-coiled, high-tensile wire with a continuous strip of flat steel barbs (barbed tape) crimped to the wire along the entire length of the wire.

The high-tensile wire shall be Class B galvanized. The barbed tape shall be made of cold-roller carbon steel and galvanized to Class 2450.

CC 05.02.03 Smooth wire

Smooth wire shall comply with the requirements of SANS 675 and shall be of the types specified below:

(a) Straining wire shall be 4,0 mm diameter and fully galvanised.

(b) Fencing wire shall be high-tensile grade, 2,24 mm diameter wire fully galvanised.

(c) Tying wire shall be 2,50 mm diameter, mild steel, galvanised wire for tying fencing wire to standards and droppers, and 1,60 mm diameter, mild steel, galvanised wire for typing netting and mesh wire to fencing wire.

CC 05.03 **DIAMOND MESH**

(a) Diamond mesh (chain-link) fencing shall comply with the requirements of SANS 1373. The edge finish shall be both sides clinched or barbed.

(b) The nominal diameter of the wire shall be **2,5 mm** and the mesh size shall be 64 x 64 mm.

(c) The wire shall be fully galvanised.

CC 05.04 **WELDED MESH**

Welded mesh fences shall be fully galvanised with mild steel wire with a minimum diameter of 1,8 mm and 75 mm mesh or similar to the existing fence being repaired.

CC 05.05 **GATES**

Gates that need to be replaced shall be the same type and size as existing gates. Gates shall be galvanised in accordance with SANS 121 for class B1 articles or shall be painted as specified.

CC 06 MEASUREMENT AND PAYMENT

CC.01 **CLEARING FENCE ROUTE 1 m WIDE STRIP** ..... Unit: metre (m)

The unit of measurement for the clearing of the fence route shall be the metre of fence line measured along each fence line.

The tendered rate shall include full compensation for the clearing of the fence line as specified (0.5m on each side of the fence), including the removal of stones and other obstructions and the disposal as directed of all material resulting from clearing operations.

CC.02 **SUPPLY AND ERECTION OF FENCING TO REPLACE DAMAGED SECTIONS:**

(a) Barbed wire ..... Unit: metre (m)

(b) Straining wire ..... Unit: metre (m)

(c) Diamond mesh ..... Unit: metre (m)

(d) Wire netting / Welded Mesh ..... Unit: metre (m)

(f) Posts ..... Unit: number

(g) Gates ..... Unit: number

(h) Y-standards ..... Unit: number

(i) BTC coil ..... Unit: metre (m)

The quantity of material used shall be determined by measuring the quantities of material installed in the completed fence. Clearing of the fence line will be paid for under item CC.01. Removal and disposing of the existing fencing material shall be deemed included in the rate for new material.

The applicable units of measurement are as follows:

(i) Fencing wire and barbed tape coil (BTC)

The unit of measurement shall be the metre of each type of fencing wire measured in place and between end posts. Binding wire and wire used for bracing and anchoring of posts shall not be measured for payment. Barbed tape coil shall not be measured along the coiled wire but also between end posts.

(ii) Diamond mesh and wire netting

The unit of measurement shall be the linear metre of diamond mesh or wire netting at the specified height stipulated in the payment item, and the quantity shall be calculated using the prescribed width and the length between straining posts or gate posts. Binding wire and wire used for bracing and anchoring of posts shall not be measured for payment.

(iii) Posts

The unit of measurement shall be the number of posts, as follows:

All straining posts erected in accordance with the maximum specified spacing or such lesser spacing as authorised by the Engineer, all corner and gateposts authorised by the Engineer and all end posts. Gate posts for *gates* shall not be measured for payment.

(iv) Gates

The unit of measurement shall be the number of each type of gate replaced. Gate ***posts*** for new gates shall not be measured for payment and shall be deemed included in the rate.

CC.03 **REMOVAL OF TREES**

(a) Tree with diameter 200mm < 450mm ..... Unit: number

(b) Tree with diameter 451mm < 1000mm ..... Unit: number

The diameter of the tree trunk shall be measured 500mm above ground level. Removal and disposing of the tree, branches, roots etc. shall be deemed included in the rate. All roots shall be removed within a distance of 1000mm from the trunk up to a depth of 1000mm below ground level. Other tree roots shall be removed as far as physically possible. The measured area shall *not* include the areas and sections cleared along the fence route as measured as part of CC.01. The Engineer shall give written instruction for each tree that has to be removed. No additional excavation shall be measured for payment.

CC.04 **REDRESS, SERVICE, TENSIONING AND TIGHTENING OF FENCE**.....Unit: metre (m)

The unit of measurement for the redressing (servicing, tightening, tensioning, repairing and patching) the fence line (including all gates, posts, poles and overhangs) shall be the metre of fence line measured along each fence line.

The tendered rate shall include full compensation for servicing, tensioning, performing minor repairs, tightening the fence and patching damaged areas.

TECHNICAL SPECIFICATION

CE WATER DISTRIBUTION NETWORKS

CONTENTS

CE 01 SCOPE

This specification covers the materials, equipment, methods, testing and work required for the maintenance and servicing of existing water distribution networks. Such distribution networks comprise of:

(a) Primary and secondary distribution pipelines
(b) Valves
(c) Bulk water meters
(d) Domestic water meters
(e) Reservoirs

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

CE 02 STANDARD SPECIFICATIONS

CE 02.01 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:

SANS 1200 D - Earthworks
SANS 1200 DB - Earthworks (pipe trenches)
SANS 1200 G - Concrete (structural)
SANS 1200 L - Medium-pressure pipelines
SANS 1200 LB - Bedding (pipes)

CE 02.02 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 25207 and Regulation Gazette No 7721 of 18 July 2003 shall be adhered to.

CE 02.03 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.

CE 03 EXECUTION OF MAINTENANCE AND SERVICING WORK

CE 03.01 GENERAL

All work shall be executed using approved materials and equipment suitable to the systems and/or installations they serve.

The said maintenance and servicing work shall be executed in accordance with the relevant codes of practice, standards, regulations, municipal laws and by-laws, manufacturer's specifications and codes of practice and all additional specifications included in this document.

CE 03.02 MAINTENANCE OF EXISTING PIPELINES

This section covers the requirements for the maintenance of the water distribution pipelines for defects such as pipe breaks and leakage for distribution pipelines.

CE 03.02.01 General

Repair work to the water distribution system *may* include but not be limited to the following:

(a) Replacement of damaged, broken, leaking, corroded surface and underground pipework and fittings;

(b) Replacement of damaged, broken and missing manhole covers and frames;

(c) Repair work to damaged manholes;

(d) Initial unblocking and clearing of all water distribution pipes and manholes;

(e) Removal of unauthorised connections;

(f) Reinstatement and making good of walls, concrete, road surfaces, etc, to an approved acceptable level where any service work has been executed;

(i) Service valves, which shall include new gaskets, gland packings, seals, bolt and nuts, etc;

(l) Where valves do not close properly, all these valves shall be refurbished and descaled;

(m) Clean and service all strainers, including the replacement of strainer elements where corroded and installation of new gaskets;

(n) Service, test and readjust pressure-reducing valves. Pressure gauges are to be recalibrated and checked. Up and downstream pressures are to be logged. Downstream pressure has to be adjusted to an acceptable level, taking into account the allowable working pressure of the system and its components;

(o) Service and check the proper functioning of all non-return valves;

(p) Service and clean out all air release valves and vacuum breakers;

(r) Service and log readings of water meters including cleaning of integral strainers;

(s) Water storage tanks are to be emptied, cleaned out and put back into operation. Ball float and/or filling valves to these tanks are to be serviced and cleaned where required;

(t) Reinstatement and making good of walls, tiling, floors, concrete, finishes, holes, chases, surfaces, etc, to an acceptable level where servicing work has been executed.

CE 03.02.02 Corrective Maintenance

(a) Excavation

The width of the excavation shall be sufficient to allow the proper laying, bedding and backfilling of the pipelines. The width of the excavation for each type and size of pipeline shall be as set out in SANS 1200 DB.

The depth of the excavation for each type and size of pipeline shall depend on site conditions and the amount by which the excavation is to exceed the proposed level of the invert of the pipeline and shall be sufficient to allow the type and thickness of bedding material instructed by the Engineer.

Where excavation is to be carried out through asphalt premix or concrete, the asphalt/concrete shall be cut neatly and vertically with approved sawing equipment before the asphalt/concrete is removed.

Excavations shall extend such that, where possible cut in may be reduced by lifting adjacent pipes.

(b) Disposal of excavated material

Where excavated material does not comply with the requirements for backfilling material as specified or is surplus to backfilling requirements, such excavated material shall be removed from the site.

Material suitable for use in the works, however, shall be used as prescribed.

(c) Pipe couplings

Repair sections will be joined, utilising existing pipe sockets and collars where possible.

Repair couplings shall be used with the approval of the Engineer.

(d) Laying of uPVC pipelines

New sections of uPVC pipelines shall be laid on a granular bed suitable for flexible pipelines as directed by the Engineer. The inside of the pipes shall be smooth and without any displacement and all pipes shall be laid true to line and level with a minimum slope of 2% or as directed by the Engineer.

Refer to SANS 1200 LB: Bedding (pipes), for the specification on bedding.

(e) Concrete encasement

Where instructed by the Engineer pipes shall be encased in concrete. All such encasing shall be done in accordance with the Engineer's instructions and sufficient allowance shall be made for movement joints.

(f) Construction in existing roads

Road crossings shall either be constructed utilising sufficient provision of bypass roads or utilising the half width of the road. At all times a through route shall be maintained for all traffic.

(g) Repairing of leaks

Where leaks occur at pipe sockets or collars the affected section shall be cut from the pipeline and repaired using couplings.

Where obvious leaks occur due to displaced sealing rubbers, the rubbers shall be replaced if the replacement can be done economically by lifting adjacent pipes.

CE 03.02.03 Quality standard

Pipelines shall be laid at even gradients within the points of correction, to the satisfaction of the Engineer and the applicable specifications.

CE 03.02.04 Materials

Materials and equipment to be used for repair items shall be suitable and/or adaptable to the existing installation.

(a) Water meters

(i) Combination water meters

Where high peak flow as well as a low flow can occur, and the low flow is out of the registration range of large water meter, a small diameter water meter shall be installed in parallel with the large water meter to cater for the low flows with integral automatic change-over valves. These valves shall be designed to have a minimum pressure drop at the operating point.

(ii) Water meters (50 mm NB and larger)

These water meters shall be of the dry type with all gears and transmission and roller counters in a dry head, and shall be equipped with flanged ends to SANS 1123, cast-iron body with high quality corrosion proof coating. The meter must be protected from magnetic fields and sealed to prevent tampering with adjustments. The meter must be able to work up to a pressure of 1600 kPa under a maximum water temperature of 40 °C. The scale of meter must be in cubic metre (m^3) and equipped with needle indicators reading in litres. The accuracy of the meter shall be not less than 98%.

The meters shall be installed with leading and trailing lengths of pipes to the manufacturer's specification.

(iii) Water meters (up to 50 mm NB)

The meter shall be of the volumetric rotary piston type with brass body equipped with union couplers. The meter reading must be in kilolitres. The meter shall have an accuracy of not less than 98%. The meter must be able to operate up to a water pressure of 1000 kPa at a water temperature of 40 °C.

The meters shall be installed with leading and trailing lengths of pipes to the manufacturers specification.

CE 03.03 CLEANING OF PIPELINES

The work under this section involves the removal of silt, debris and lime deposits from within the pipelines and the general cleaning in areas resulting from leakage.

CE 03.03.01 Servicing

Prior to the cleaning of any pipeline sections, the Contractor shall arrange with the Engineer for an inspection of the pipe route. Based on the inspection, the Engineer will instruct the Contractor as to which sections of the network require cleaning.

Visual inspections utilising check circuit TV cameras will not be required.

The method to be applied for the cleaning of the pipelines will be chemical or mechanical and shall be followed by disinfection of the related section. The method to be applied for each section of the pipeline will be instructed by the Engineer.

Material removed from the pipelines shall be disposed of as instructed by the Engineer.

The Contractor shall discuss the method proposed for the scouring of the pipelines where insufficient scour valves are present with the Engineer prior to implementation.

CE 03.03.02 Quality standard

Pipelines shall be cleaned such that head losses along the pipe route are negligible under simulated fire flow, when measured at convenient points along the route.

CE 04 MEASUREMENT AND PAYMENT

CE.01 **Bulk Water Meters**.....Unit: number (no)

The unit of measurement shall be the number of bulk water meters installed.

The tendered rates shall include full compensation for all transport to the place of installation, storage, labour costs.

CE.02 **Replacement of damaged/missing manhole covers, grid inlets and the like**

(a) Covers, grids, etc, only:

(i) Maximum dimension up to 900 mm ..... Unit: number

(ii) Maximum dimension over 900 mm ..... Unit: number

The unit of measurement shall be the number of covers replaced. The classification of the size of each cover or frame will be based on the nominal dimensions of the unit and not on the actual dimensions.

The tendered rates shall include full compensation for procuring, furnishing and placing the new covers or grids. The tendered rates shall also include full compensation for removing and disposing of the damaged covers and grids from the site.

CE.03 **Scouring of pipeline to remove trapped debris** .....Unit: metre (m)

The unit of measurement shall be metre length of pipe cleaned or scoured.

The unit rate of measurement for item CA.03 shall include full compensation for the emptying of the pipeline, cleaning, refilling and reporting on the condition of the pipe after cleaning. The rate shall also include the disposal of waste material in and appropriate manner.

The unit of measurement for item CA.03 shall include full compensation for the scouring of the pipeline and refurbishing of the pipeline. The unit of measurement shall be the total length of filled pipeline from which the water is scoured. The length shall be agreed with the Engineer prior to scouring.

The provision of additional scour points shall also be included in the rate.

CE.04 **Servicing of valves** ..... Unit: number

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

The tendered rate shall include full compensation for cleaning, removing rust, scale or other solids from surfaces or moving parts, proper greasing of all moving parts, preparation for corrosion protection coating and painting of valves.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

CE.05 **Recondition valves** ..... Unit: number

The unit of measurement shall be the number of valves reconditioned.

The tendered rate shall include full compensation for decommissioning, dismantling, cleaning, removing rust, removing scale or other solids from surfaces and moving parts, replacing components such as hinges, spindles, hard wheels or gates, swing axles, swing gates, replacing or repair of seals, skimming of seal surfaces, proper greasing of all moving parts, preparation for corrosion protection, painting and recomissioning or any other action or cost necessitated to recondition a value to a perfect functional drop tight condition.

CE.06 **Cleaning of manholes, chambers and other structures**..... Unit: number (no)

The unit of measurement shall be the number of manholes, chambers or other structures related to the water distribution network, cleaned.

The tendered rate shall include full compensation for all labour, equipment and tools for removal of the material, trimming the bedding and for loading, transporting and disposing of the material.

CE.07 **Sterilization of Reservoir**..... Unit: number

Before the reservoir is sterilized, the pipelines serving the reservoir shall have been sterilized. The reservoir shall then be thoroughly cleaned out and washed down with clean water.

The roof and walls shall thereafter be thoroughly sprayed down, using pressurised equipment, and the walls, roof and floors shall be scrubbed with the solution specified in sub-clause 5.10 of SANS 1200 L.

On completion of the sterilization, the sterilizing solution shall be run to waste before the reservoir is filled for testing water tightness.

CE.08 **Repair / Replace existing pipelines** ..... Unit: metre (m)

The unit of measurement shall be per metre length of pipe replaced or newly installed. In each case the Contractor shall agree on the length of pipe to be replaced / installed and the method of coupling the pipes.

The tendered rate shall include full compensation for cleaning and grubbing, excavation (in all material types except *hard rock excavation* which shall be measured for payment elsewhere), the removal of the existing pipeline and fittings (if any), dealing with water logged conditions, provision of bedding and backfill material, logging and backfilling of replacement pipeline, finishing, repair of kerbs, road surfaces, accommodation of traffic, excavation in all materials, removal of unsuitable material from the trench, disposal and haul of surplus materials.
The provision of the **pipes and fittings** shall be deemed included in the rate tendered for a specific type and size as required – including all pipes, bends, tees, reducers and couplings. Valves shall be measured separately for payment.

TECHNICAL SPECIFICATION

CF SEWERAGE NETWORKS

CONTENTS

CF 01 SCOPE

This specification covers all aspects regarding the general maintenance and servicing of sewerage networks which may include the following installations:

(a) Sewer pipelines and manholes
(b) Septic tanks.

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

CF 02 STANDARD SPECIFICATIONS

CF 02.01 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:

SANS 1200 D - Earthworks
SANS 1200 DB - Earthworks (pipe trenches)
SANS 1200 L - Medium-pressure pipelines
SANS 1200 LB - Bedding (pipes)
SANS 1200 LC - Cable ducts
SANS 1200 LD - Sewers

CF 03 EXECUTION OF MAINTENANCE WORK

CF 03.01 MAINTENANCE OF EXISTING PIPELINES AND STRUCTURES

This section covers the work in connection with the construction of sewerage networks and associated sewerage structures such as manholes, cleaning eyes and the like. It also covers the removal and replacement of damaged and broken pipes and sewerage structures, as well as repairs to existing pipes and structures.

CF 03.01.01 **Corrective Maintenance**

(a) Excavation

The width of the excavation shall be sufficient to allow the proper laying, bedding and backfilling of the pipelines. The width of the excavation for each type and size of pipeline shall be as specified in SANS 1200 DB.

The depth of the excavation for each type and size of pipeline shall depend on site conditions and the amount by which the excavation is to exceed the proposed level of the invert of the pipeline and shall be sufficient to allow for the type and thickness of bedding material as instructed by the Engineer.

Where excavation is to be carried out through asphalt premix or concrete, the asphalt/concrete shall be cut neatly and vertically with approved sawing equipment before the asphalt/concrete is removed.

Excavations shall extend such that, where possible, cut in may be reduced by lifting adjacent pipes.

(b) Removal of damaged pipelines

Where indicated by the Engineer damaged sections of pipelines shall be completely removed and replaced.

Excavation shall be carried out as described for new pipeline installation and the excavated material shall be, if suitable, preserved for backfilling. The damaged pipe materials shall be disposed of where instructed by the Engineer.

(c) Pipe couplings

Repair sections shall be joined utilising existing pipe sockets and collars where possible.

Repair couplings shall be used with the approval of the Engineer.

(d) Concrete encasement

Where instructed by the Engineer pipes shall be encased in concrete. All such encasing shall be done in accordance with the Engineer's instructions and sufficient allowance shall be made for movement joints.

(e) Construction in existing roads

Road crossings will either be constructed utilising sufficient provision of bypass roads, or they will be done utilising the half width of the road. At all times a through route shall be maintained for all traffic.

(f) Repairing of leaks

Where leaks occur at pipe sockets or collars the effected section will be cut from the pipeline and repaired using repair couplings.

Where obvious leaks occur due to displaced sealing rubbers they will be replaced if the replacement can be done economically by lifting adjacent pipes.

(g) Testing

The drainage system shall be tested according to the specifications laid down by the NBRI. This test shall be carried out in the presence and to the satisfaction and approval of the Engineer.

(h) Ingress of foreign material

During corrective maintenance all pipe ends are to be suitably plugged to prevent any ingress of dirt, rubble, etc.

CF 03.01.02 Quality standard

Pipelines shall be laid at even gradients to the satisfaction of the Engineer and the applicable specifications.

CF 03.01.03 Air test for sewer and drains

The following air test as specified in the NBRI information sheet X/BOU 2-34 shall be applicable to all air tests on new sewers and drains installed under the repair Contract, and shall be executed by the Contractor and witnessed by the Engineer.

(a) Method of air testing

All openings in the pipeline are plugged by means of sewer testing plugs. The sewer plug at the lowest end of the pipeline is connected to an air supply hose, which is attached to a mechanically driven air blower, compressor or hand pump. Air is pumped into the pipeline at a pressure of approximately 375 mm water gauge. The pressure is held at this level for a period of two minutes to allow the air temperature to become constant. Subsequently the air supply is closed off and the time recorded for the air pressure to drop from 250 to 125 mm water gauge. If the recorded time is less than the value given in the table below, it means that the pipeline is leaking and does not comply with the required standards of tightness. The apparatus required for the air test is commercially available.

The following requirements have to be taken into account when performing the air test:

(i) Air-permeable pipelines such as vitrified clay or asbestos cement should preferably be tested when moist or wet.

(ii) The trench shall be partially backfilled before the test is carried out. This is required to stop possible temperature variations and to prevent damage to the pipeline during subsequent backfilling operations.

(iii) The testing equipment shall be shielded from the direct rays of the sun.

(iv) Flexible joints are recommended for sewer and drain pipelines. Good quality flexible joints are superior to cement caulked joints and they also provide the pipeline with flexibility to prevent cracking due to subsequent soil movement.

(v) The test method is very sensitive to flaws in the pipeline, such as cracks or leaking joints. The actual positions of flaws along the pipeline can be determined by using the specialised equipment.

(vi) If the pipeline is below the water table and subjected to external water pressure, the test method should be modified by the Engineer to ensure that the final pressure value is higher than that of the external water pressure acting on the lowest part of the installation.

The minimum times for pressure drop of 250 mm to 125 mm water gauge are given in table CF 04.02.05/1 below.

TABLE CF 04.02.05/1

PIPE DIAMETER (mm)	MINIMUM TIME (min - s)	CRITICAL LENGTH OF PIPELINE (m) (58 m^2 internal surface area)	MINIMUM TIME(s) FOR LONGER LENGTH (L) OF PIPELINE
100	1 to 58	184,6	0,640 L
150	2 to 57	123,1	1,439 L
200	3 to 56	92,3	2,559 L
225	4 to 26	82,1	3,239 L
250	4 to 55	73,8	3,998 L
300	5 to 54	61,5	5,757 L
375	7 to 23	49,2	8,996 L
450	8 to 51	41,0	12,954 L
525	10 to 20	35,2	17,632 L
600	11 to 49	30,8	23,030 L

CF 03.02 **CLEANING OF SEWERAGE NETWORK**

The work involved under this section is the removal of silt, debris and vegetation from within the pipelines and manholes and the general cleaning of areas where leakage has occurred. This can be done either mechanically or chemically according to the more appropriate method as specified by the Engineer.

CF 03.02.01 **Corrective Maintenance**

The Contractor shall arrange with the Engineer for an inspection of the pipe route before the cleaning of any pipeline sections is carried out.. Based on the inspection, the Engineer will instruct the Contractor as to which sections of the network require cleaning.

The method to be applied for the cleaning of the pipelines shall be chemical or mechanical. The method to be used for each section of the pipeline will be instructed by the Engineer.

CF 04 **MEASUREMENT AND PAYMENT**

CF.01 **Mechanical cleaning of sewer pipes and structures**.....Unit: metre

The unit of measurement shall be the metre of pipe cleaned, measured once along the soffit of the culvert.
The tendered rates shall include full compensation for removing the material, for disposing of the material in an approved manner and ensuring that the material will not wash into drainage trenches.

TECHNICAL SPECIFICATION

CG REFUSE REMOVAL AND PEST CONTROL

CONTENTS

CG 01 SCOPE

This specification covers the requirements for maintenance and facility management work related to solid waste management, refuse removal and pest control.

CG 02 DETAIL OF MAINTENANCE AND SERVICING WORK

The Contractor shall ensure that the necessary materials, skilled personnel, tools and equipment are available at all times to perform his duties. The work shall include the collection and removal of existing litter, rubble and other solid waste across the entire site. The Contractor shall be responsible for removing all scattered waste that existed prior to the contractor commencing with maintenance and servicing work in order to clean the entire site to a clean and healthy state. Collection of solid waste shall be performed under the guidance of the Engineer.

The Contractor shall transport solid waste collected across the entire site to a central container for removal to a disposal site off site. Removal of solid waste from the central container to a disposal site off site (to a registered solid waste dumping site) shall be the responsibility of the Contractor as part of monthly maintenance tasks.

CG 02.01 LITTER COLLECTION

All litter and rubble shall be collected within the external perimeter fences of the various Ports of Entry and removed and disposed of.

CG 02.02 WASTE COLLECTION

Waste bins are provided at each residential unit, offices and service buildings. The waste bins at all residential units shall be cleaned out on a weekly basis. Waste bins in public areas shall be cleaned out daily. The storage of the solid waste at the solid waste disposal area until such time as it is removed from site will be the responsibility of the Contractor in a skip (on-site) at a central location within the site.

CG 02.03 REMOVAL OF SOLID WASTE

Removal of solid waste from the central solid waste container (skip) to a formal solid waste facility shall be the responsibility of the Contractor.

CG 02.04 **PEST CONTROL**

The implementation of Pest and Rodent control by a specialised subcontractor shall be measured separately for internal and external applications for the areas identified by the Engineer based on the Pest Control Plan submitted by the Contractor.

GENERAL

Integrated Pest Management (IPM) is a process for achieving long-term, environmentally sound pest suppression and prevention through the use of a wide variety of technological and management practices. Control strategies in an IPM program include:

- Structural and procedural modifications to reduce food, water, harborage, and access used by pests.
- Pesticide compounds, formulations, and application methods that present the lowest potential hazard to humans and the environment.
- Non-pesticide technologies such as trapping and monitoring devices.
- Coordination among all facilities management programs that have a bearing on the pest control effort.

The Contractor shall furnish all supervision, labour, materials, and equipment necessary to accomplish the monitoring, trapping, pesticide application, and pest removal components of the IPM program.

PESTS INCLUDED AND EXCLUDED

The Contractor Shall Adequately Suppress the Following Pests:
1. Indoor populations of rodents, insects, arachnids, and other arthropods.
2. Outdoor populations of potentially indoor-infesting species that are within the property boundaries of the specified buildings.
3. Nests of stinging insects within the property boundaries of the specified buildings.
4. Individuals of all excluded pest populations that are incidental invaders inside the specified buildings, including winged termite swarmers emerging indoors.
5. Termites and other wood-destroying organisms.

Populations of the Following Pests are excluded from this contract:
1. Birds, bats, snakes, and all other vertebrates other than commensal rodents.
2. Mosquitoes.
3. Pests that primarily feed on outdoor vegetation.

INITIAL BUILDING INSPECTIONS

The Contractor shall complete a thorough, initial inspection of each building or site at least ten (10) working days prior to the starting date of the application. The purpose of the initial inspections is for the Contractor to evaluate the pest control needs of all locations and to identify problem areas and any equipment, structural features, or management practices that are contributing to pest infestations.

PEST CONTROL PLAN

The Contractor shall submit a Pest Control Plan at least five (5) working days prior to the starting date of the application. Upon receipt of the Pest Control Plan, the Engineer will render a decision regarding its acceptability within two (2) working days. If aspects of the Pest Control Plan are incomplete or disapproved, the Contractor shall have two (2) working days to submit revisions. The Contractor shall be on-site to perform the initial service visit for each building within the first five (5) working days of the contract.

The Pest Control Plan shall consist of five parts as follows:

1. Proposed Materials and Equipment for Service: The Contractor shall provide current labels and Material Safety Data Sheets for all pesticides to be used, and brand names of pesticide application equipment, rodent bait boxes, insect and rodent trapping devices, pest monitoring devices, pest detection equipment, and any other pest control devices or equipment that may be used to provide service.

2. Proposed Methods for Monitoring and Detection: The Contractor shall describe methods and procedures to be used for identifying sites of pest harborage and access, and for making objective assessments of pest population levels throughout the term of the contract.

3. Service Schedule for Each Building or Site: The Contractor shall provide complete service schedules that include weekly or monthly frequency of Contractor visits, specific day(s) of the week of Contractor visits, and approximate duration of each visit.

4. Description of any Structural or Operational Changes That Would Facilitate the Pest Control Effort: The Contractor shall describe site-specific solutions for observed sources of pest food, water, harborage, and access.

5. Commercial Pesticide Applicator Certificates or Licenses: The Contractor shall provide photocopies of Commercial Pesticide Applicator Certificates or Licenses for every Contractor employee who will be performing on-site service under this contract.

The Contractor shall be responsible for carrying out work according to the approved Pest Control Plan. The Contractor shall receive the concurrence of the Engineer prior to implementing any subsequent changes to the approved Pest Control Plan, including additional or replacement pesticides and on-site service personnel.

RECORD KEEPING

The Contractor shall be responsible for maintaining a pest control logbook or file for each building or site specified in this contract (included in monthly remuneration for maintenance of fencing, cleaning and site keeping). These records shall be kept on-site and maintained on each visit by the Contractor.

USE OF PESTICIDES

The Contractor shall be responsible for application of pesticides according to the label. All pesticides used by the Contractor must be registered. Transport, handling, and use of all pesticides shall be in strict accordance with the manufacturer's label instructions and all local laws and regulations.

The Contractor shall adhere to the following rules for pesticide use:

A. Approved Products: The Contractor shall not apply any pesticide product that has not been included in the Pest Control Plan or approved in writing by the Engineer.
B. Pesticide Storage: The Contractor shall not store any pesticide product in the buildings specified in this contract.
C. Application by Need: Pesticide application shall be according to need and not by schedule.
D. Minimization of Risk: When pesticide use is necessary, the Contractor shall employ the least hazardous material, most precise application technique, and minimum quantity of pesticide necessary to achieve control.

QUALITY CONTROL

The Contractor shall establish a complete quality control program to assure the requirements of the contract are provided as specified. The program shall include at least the following items:

A. Inspection System:
The Contractor's quality control inspection system shall cover all the services stated in this contract. The purpose of the system is to detect and correct deficiencies in the quality of services before the level of performance becomes unacceptable and/or the Engineer identifies the deficiencies.

B. Checklist:
A quality control checklist shall be used in evaluating contract performance during regularly scheduled and unscheduled inspections. The checklist shall include every building or site serviced by the Contractor as well as every task required to be performed.

C. File:
A quality control file shall contain a record of all inspections conducted by the Contractor and any corrective actions taken. The file shall be maintained throughout the term of the contract and made available to the Engineer upon request.

D. Inspector(s):
The Contractor shall state the name(s) of the individual(s) responsible for performing the quality control inspections.

CG 03 MEASUREMENT AND PAYMENT

CG.01 REFUSE REMOVAL..... Unit: month

The unit of measurement shall be the month for which refuse and waste material is removed from waste-skip on site, irrespective of the type of material and contents on a weekly basis.

The tendered rate shall include full compensation for all labour, equipment and tools for collecting, loading, transporting and disposing of the material from the site to an approved dumping site, off site.

CG.02 SUPPLY OF WASTE BINS ..... Unit: number

The unit of measurement shall be the number of municipal-type waste bins supplied as described in the schedule of quantities. The tendered rate shall include full compensation for the supply, transportation and placing of the waste bins. The waste bins to be supplied for residential units shall have roller wheels and shall be able to handle the capacity of at least two black waste disposal bags.

CG.03 **PEST CONTROL PLAN (INTERNAL & EXTERNAL) ..... Unit: number**

The unit of measurement shall be the number pest control plans compiled and submitted (one per site) - in accordance with the specification prior to implementation of pest control. This plan shall also be incorporated in the contractor's maintenance control plan.

The tendered rate shall include full compensation for travelling, subsistence and labour and printing required for compiling the report.

CG.04 **PEST CONTROL (INTERNAL) ..... Unit: number**

The unit of measurement shall be the number of internal pest control performed (all buildings on the Port of Entry premises) Pest, termite and rodent control performed as instructed by the Engineer.

CG.05 **PEST CONTROL (EXTERNAL) ..... Unit: number**

The unit of measurement shall be the area of external pest control performed (entire Port of Entry and open areas) Pest, termite and rodent control performed as instructed by the Engineer.

TECHNICAL SPECIFICATION

CK SUPPLY OF POTABLE DRINKING WATER

CONTENTS

CK 01 SCOPE

This specification covers the supply of adequate potable water into the existing storage tanks at the Ports of Entry should a water shortage be experienced.

The Contractor shall be responsible for the purchase, transport to site, testing and delivery of water of an acceptable potable standard.

CK 02 STANDARD AND REQUIREMENTS

These specifications shall be read in conjunction with the following documents:

SANS 241: Drinking Water
SANS 295: Calcium hypochlorite

CK 03 DETAIL OF WORK

Potable water, suitably disinfected, shall be delivered to the Port of Entry as specified in the Schedule of Quantities on an ad-hoc basis **(on instruction from the Engineer)** and pumped into an existing storage tank.

The contractor shall be responsible for the monitoring of the water level in the storage tank, testing as well as all aspects of the supply of water.

CK 04 MONITORING OF STORAGE TANK ON SITE

The Contractor shall be responsible for the *monitoring* of the levels of the water storage tanks at the Ports of Entry and Borderline Bases on the following points:

(i) Level — *minimum* level 40% of capacity.

(ii) Hygiene — Sample of water must be tested on a monthly basis. (Standard SANS 241)

(iii) Leakage — all leaks on tank must be rectified.

Written record of the above must be submitted monthly for the duration of the Contract as part of the monthly updated maintenance control plan.

CK 05 MEASUREMENT AND PAYMENT

CK.01 **WATER SUPPLY**.....Unit: kilolitre

The tendered rate shall include full compensation for the supply of water *per kilolitre* deliver to the specified Port of Entry or Borderline Base including all costs for acquisition, transport, delivery, labour and pumping into existing reservoir.

CK.02 **POTABLE WATER TESTING**.....Unit: number

The unit of measurement shall be the number of potable water tests performed in accordance with South African National Standards (SANS) 241:2006 for drinking water. All tests shall be performed by an authorised approved testing laboratory.

CK.03 **MONITORING OF POTABLE WATER LEVELS**.....Unit: month

The unit of measurement shall be the complete month on which the contractor provide daily water levels of the storage reservoir and recorded on the prescribed format.

TECHNICAL SPECIFICATION

EA BOREHOLE PUMP SYSTEMS

CONTENTS

EA 01 SCOPE

This specification covers the decommissioning, removal, service and reconditioning, installation, testing, commissioning and maintenance of borehole pumping equipment, motor control devices and low-voltage cables. It also includes the pump testing of all boreholes to determine the borehole yield and optimum use of each borehole. The function of borehole pump systems shall be delivery of raw water at a specified flow rate and head to the required location.

EA 02 STANDARD SPECIFICATIONS

EA 02.01 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:

BS 5316, Part 1	-	Acceptance tests for centrifugal, mixed flow and axial pumps
SANS 948	-	Three-phase induction motors
SANS 1222	-	Enclosures for electrical equipment classified by IP code
BS 4999	-	General requirements for rotating electrical machines
ISO 281/1	-	Rolling bearings – dynamic load ratings and rating life.

EA 03 DESCRIPTION OF SERVICING AND TESTING WORK

EA 03.01 PUMP TESTING OF BOREHOLES

This section covers the requirements of the pump testing of the boreholes.

EA 03.01.01 Testing

It will be the responsibility of the Contractor to arrive on site with all equipment and materials required to complete the work without interruption.

The Contractor shall provide suitable plant to enable the installed pumping equipment to be removed and reinstalled. This includes the removal and reinstallation of motorised pumps and may also include the recovery of existing pumping equipment previously lowered into a borehole.

(a) Arrival-on-site actions

The Contractor shall firstly establish whether or not the borehole is equipped. If so, the Contractor will be required to:

(1) Remove the equipment, taking care not to damage either the equipment or the installation,

(2) inspect the equipment for defects, and

(3) note down all particulars regarding the equipment and the installation.

The latter shall include but not be limited to the make and type of pump (and motor if motorised), the depth to which the pump was installed, the power rating of the motor and the diameter, length and quantity of pump column sections.

The Contractor shall next establish whether there are any other boreholes in the vicinity that need to be tested. Should this be the case, the following information shall be gathered and recorded for each borehole:

(1) The straight-line distance (in metres) between each such borehole to be tested;

(2) whether the borehole is equipped, open or sealed and, if equipped,

(3) whether the installation is operational or not.

Depending on the degree of access available to such a borehole, the Contractor shall improve the access until it is adequate to reach the borehole and establish whether there is water in the borehole and if so, measure and record:

(1) The depth to the ground-water rest level;

(2) the height of the borehole collar above ground level, and

(3) the depth of the borehole.

The final activities to be carried out prior to the actual installation of the test pump into the borehole to be tested shall comprise measuring and recording:

(1) The diameter of the borehole;

(2) the depth of the borehole as determined by means of a weighted line or plumb bob, and

(3) the depth to the ground-water rest level in the borehole, with reference to a date level.

(b) Test pump installation

The conduit tube shall be attached and secured to the first section of pump column behind the pump element and the test pump installed to the required depth, attaching and securing the conduit tube to the riser main every 2 to 3 metre. If the pump installation depth has not been specified by the Engineer beforehand, then the depth must be determined on the basis of the guidelines provided.

GUIDELINES FOR TEST PUMP INSTALLATION DEPTH IF NOT SPECIFIED

DEPTH OF WATER IN BOREHOLE	TEST PUMP INSTALLATION DEPTH
Less than 5 m	Do not install the test pump
Between 5 m and 30 m	± 2 m above the bottom of the borehole
Between 30 m and 60 m	± 3 m above the bottom of the borehole
Between 60 m and 90 m	± 4 m above the bottom of the borehole
More than 90 m	± 5 m above the bottom of the borehole

NOTE:
1. Depth of water in borehole is calculated as the difference between the total depth of the borehole and the depth to the ground-water rest level as measured.
2. ± denotes a variation of not more than 0,5 m either way.

(c) Equipment set-up and pre-test actions

Where possible, the discharge pipe must be laid in a downhill direction from the borehole to be tested, provided this will take the pipe in the direction of or past another borehole located in the vicinity of the borehole to be tested. In such instances, lay the discharge pipe in a downhill direction that will take its furthest end as far as possible away from any other borehole in the vicinity.

In field situations where the terrain is extremely flat, the length of the discharge pipe shall be extended from 50 m to at least 300 m if any possibility exists that the discharged water may infiltrate to the ground-water resource within the radius of influence of the test. The dip meter should be inserted into the installed conduit tube and run down this tube to the bottom. Make sure that it passes freely down the full length of the tube. If the dip meter used is not graduated to an accuracy of 0,01 m, the position is to be marked on the dip meter cable indicating the depth to the ground-water rest level, and the end of the graduated tape attached at this position on the cable ensuring that the zero mark of the graduated tape corresponds exactly to this mark. Slowly lower the dip meter and graduated tape down the conduit tube, in the process securing the tape to the dip meter cable every 2 to 3 metre. Ensure that there is no slack between each point where the tape is secured to the dip meter cable. Also make sure that the dip meter cable and graduated tape combination passes freely along the full length of the conduit tube.

The Contractor will be remunerated for this work per set-up at the rate tendered for one such activity as set out in the Schedule of Quantities.

(d) Final pre-test measurements

The Contractor shall ensure that all the basic information required on the field data sheet is collected and recorded as completely as possible. The basic information data entry fields can be used as a checklist for information to be measured/collected and recorded. The Contractor shall not guess any information which has not been measured.

Payment for this work shall be incorporated into the payment for data recording as described below.

(e) Data recording

(i) Discharge measurements

The measurement of discharge (yield or pumping rate) must be consistently accurate and reliable and shall be appropriate to meet this requirement. Where volumetric calculation methods are applied, time will be measured using a stopwatch and the container volume must be accurately known. The volumetrically measured yields recorded on the field data sheets shall be based on the average obtained from a set of three sequential measurements. Guidelines for the number and periodicity of discharge rate measurements for each type of test are given below.

NUMBER OF PERIODICITY OF DISCHARGE RATE MEASUREMENTS

TYPE OF TEST	DISCHARGE RATE MEASUREMENTS	
	NUMBER	PERIODICITY
Calibration test	2 per step	At ± 5 and ± 10 minutes into each step
Stepped discharge test	5 per step	At ± 5, ± 15, ± 30, ± 60 and ± 90 minutes into each step
Constant discharge test	See periodicity column	At ± 5, ± 15, ± 30, ± 60, ± 90 and ± 120 minutes into test and every 60 minutes thereafter for the full duration of pumping

(ii) Water-level measurements

Rigid guidelines for the periodicity of water-level measurements for each type of test are given in table EA 04.02.01/3. This information can be found duplicated on the field data sheets which must be filled in as a record of all data collection activities carried out for a pumping test. The type of water-level measurement values required to be recorded on the field data sheets are the actual (or true) draw down values. These values represent measurements which reflect the depth of the water level below the ground-water rest level depth, ie which already take into account the ground-water rest level depth below the reference measuring point. It shall be noted that the more basic type of measurement which reports the depth of the dynamic water level as a distance below the reference measuring point, ie which combines the depth of the water level below the ground-water rest level depth and the depth of the ground-water rest level below the reference measuring point, gives only an apparent (or false) draw down value. All water-level measurements must be measured to an accuracy of at least 0,01 m (10 mm). The water-level data shall be plotted on the semi-logarithmic graph paper provided with each set of field data sheets. The plotting of the data shall be done as the test proceeds, ie each water-level measurement shall be plotted on the graph as soon as possible after measuring. The field data sheets and accompanying water-level graphs shall be shown to authorised supervisory personnel at request and shall be up-to-date at the time of such request.

(iii) Other information

The Contractor shall also record any extraordinary observations made during the test. These may include:

(1) Changes in the colour of the discharged water;

(2) changes in the turbidity of the discharged water;

(3) the presence of air in the discharged water, and

(4) rainfall events which occur during a test.

PERIODICITY (IN MINUTES) OF MEASUREMENTS DURING PUMPING TESTS

CALIBRATION TEST	STEPPED DISCHARGE TEST	CONSTANT DISCHARGE TEST	RECOVERY TEST
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
7	7	7	7
9	9	9	9
12	12	12	12
15	15	15	15
	20	20	20
	25	25	25
	30	30	30
	40	40	40
	50	50	50
	60	60	60
	70	70	70
	80	80	80
	90	90	90
	100	120	120
		150	150
		180	180
		210	210
		240	240

EA 03.01.02 **Equipment and materials**

This represents the test unit and all ancillary equipment and materials required to accurately and efficiently perform borehole testing. Details are provided below.

(a) Test unit

The test unit shall comprise a positive displacement (PD) type pump element and a pump head driven by a motor fitted with an accelerator, gearbox and clutch. The unit must be in good working order and capable of maintaining a minimum of 72 hours of continuous operation.

The unit must be capable of delivering water at a rate in excess of the expected maximum yield of the borehole to be tested. It may be acceptable under certain circumstances to employ a submersible pump for testing purposes. This must, however, be identified in the tender enquiry document. It is imperative that any submersible pump used for testing purposes be equipped with a non-return valve fitted at the bottom of the pump column (rising main).

(b) Discharge piping

Discharge piping comprises both the pipe (rising main or pump column) which brings the water to surface and the pipe (discharge hose) used to lead the pumped water away from the borehole being tested. The Contractor shall supply sufficient rising main to set the test pump at a depth of at least 100 m below the surface. It may, however, be required under certain circumstances to set the test pump at a greater depth in the borehole. Where necessary it shall be discussed with the Engineer prior to the installation of the test pump. The pump column must be of uniform diameter throughout. The Contractor shall also provide at least 50 m discharge piping. This must be free of leaks for its entire length. It may again, under certain circumstances, be required to discharge the pumped water at a point further away than 50 m (possibly in excess of 300 m) from the borehole being tested. In such instances, a similar procedure to that discussed above in regard to the rising main must be followed.

(c) Discharge measuring equipment/Instrumentation

This equipment/instrumentation must be adequate to accurately measure the pumping rate within the range of yields expected from successful project boreholes. If volumetric methods are used, a stopwatch for measuring time to an accuracy of at least one-tenth of a second is required. The full capacity of each container shall be determined accurately. The Contractor shall also ensure that a container stands level when used for discharge measurements. Guidelines regarding the use of different size containers for volumetric discharge rate measurements in specific yield ranges are given in table below. Other acceptable instruments that may be used for discharge measuring are: (1) an orifice weir and (2) a flow meter. The use of these instruments is subject to various application criteria.

(i) Orifice weirs

These must be installed in a horizontal position at the end of the discharge pipe. The orifice plate opening must be sharp, clean, bevelled to 45 degrees and have a diameter less than 80 per cent of the diameter of the approach tube to which it is fixed. The orifice plate must be vertical and centred on the end of the approach tube. There must be no leakage around the perimeter of the orifice plate mounting. The piezometer tube must not contain

entrained air bubbles at the time of pressure head measurement. The latter measurement must be at least three times the diameter of the orifice.

YIELD RANGE VERSUS CONTAINER SIZE FOR VOLUMETRIC MEASUREMENTS

YIELD RANGE	CONTAINER SIZE
Less than 2 litre/s	20 litre
2 litre/s to 5 litre/s	50 litre
5 litre/s to 20 litre/s	210 litre
20 litre/s to 30 litre/s	500 litre
30 litre/s to 50 litre/s	1000 litre
More than 50 litre/s	Other suitable methods

The orifice weir equipment must be calibrated for various combinations of approach tube and orifice diameters so that pressure head readings can be converted to accurate discharge measurements.

(ii) Flow meters

Flow meters must be calibrated and of similar diameter to that of the discharge pipe. The latter must be straight and of uniform diameter for a distance of four times the diameter of the pipe before the position of the meter. There must be no turbulent flow or entrained air in the discharge pipe before the meter. The discharged water must be free of solid material carried in suspension.

It is recognised that some water leakage will generally occur especially at the borehead during pumping. This is acceptable provided that: (1) such leakage does not interfere with any water-level monitoring and (2) the total amount of leakage to the end of the discharge pipeline does not exceed one per cent of the pumping rate as measured at the end of this pipeline.

(d) Water-level measuring equipment/instrumentation

The Contractor shall provide at least three water-level measuring devices which are each capable of providing an accuracy of at least 0,01 m (10 mm) and are of sufficient length to match the pump installation depth. If ungraduated electrical contact meters (dip meters) are used for this purpose, each such instrument must be equipped with a measuring tape of an acceptable length and approved standard and which is graduated to an accuracy of at least 0,01 m (10 mm). These instruments must be in good working order and number at least one spare for each two on site.

The Contractor shall further provide conduit tubing of sufficient length to match the pump installation depth. The diameter of this tube must be large enough (minimum 15 mm) to allow free movement of the dip meter probe and cable therein. The tubing must be made of material strong enough to withstand reasonable pressure on its sidewall which might cause a constriction. The tube must be open at its lower end to allow the free entrance of water into the tube. This is facilitated by perforating the

bottom section of the conduit tube sidewall. Precautions shall also be taken to prevent the dip meter probe from passing beyond the bottom end of the conduit tube and, as a result of entanglement, not able to be withdrawn.

(e) Other materials

No pumping test should commence without field data sheets on which to record all data and information relevant to the test pumping activities in an acceptable format. These can either be provided by the Contractor or the Engineer.

EA 04 TESTING AND COMMISSIONING

EA 04.01 TESTS TO BE PERFORMED

(a) All pumping equipment shall be subject to the commissioning tests as described in Additional Specification SC: General Decommissioning, Testing and Commissioning.

(b) At least one of each type or size of pump supplied shall be subject to a delivery flow rate test. Flow rate or volumetric flow testing facilities will be supplied by others, unless otherwise specified in the detail specification.

(c) The operating point of each pump shall be determined.

(d) Efficiency tests will only be performed when specified in the detail specification.

(e) NPSH tests will only be performed when specified in the detail specification.

EA 04.02 PUMP OPERATING POINT

During the day 1 commissioning tests the pump operating point shall be determined by observing the following:

(a) Pump delivery and suction pressures, and

(b) Electric motor power consumption.

If no efficiency tests are required in the detail specification then the motor power consumption shall be calculated from the voltage and current measurements obtained during the commissioning test.

The Contractor shall supply the necessary adaptors, fittings and pressure gauges to measure the suction and delivery pressures. If no gauge fittings exist on the suction side, then the suction pressure conditions will be calculated from the system properties.

EA 04.03 FLOW RATE (DELIVERY), EFFICIENCY AND NPSH TESTS

(a) Testing will be done in accordance with BS 5316 Part 1, class C tests.

(b) Power consumption of electric motors shall be as determined by the three-

wattmeter method where efficiency tests are required in the detail specification.

EA 04.04 **TEST CONDITIONS**

(a) All tests will be performed in situ.

(b) The pumped medium or liquid specified as the process liquid in the detail specifications shall be utilised during the tests. The Contractor shall obtain from the pump manufacturer the test point for clean water corresponding to the specified duty point for the pumped liquid, in order to relate the measured performance to the pump supplier's curves which are based on water.

EA 05 MEASUREMENT AND PAYMENT

EA.01 **PUMP TESTING OF BOREHOLES** ..... Unit: number

The unit of measurement shall be the number of boreholes tested on the written instructions of the Engineer.

The tendered rate shall include full compensation for all labour, equipment and material required for the complete testing of the boreholes in accordance with the specification.

Extra over EA.01 for:

(a) The removal of existing equipment ..... Unit: number

The unit of measurement shall be the number of boreholes from which all the equipment is removed. The tendered rate shall include full compensation for the removal of existing operational pumps and motors and all associated pipework.

(b) Installation of temporary pumps ..... Unit: number

The unit of measurement shall be the number of temporary pumps installed and later retrieved. The tendered rate shall be fully inclusive of the pump and pipes required to effectively test the boreholes in accordance with the specifications.

(d) Ground-water sampling ..... Unit: number

The unit of measurement shall be the number of boreholes of which the water is sampled. The tendered rate shall be fully inclusive of the requirements of the specification irrespective of the number of samples taken from a borehole.

(e) Compilation of borehole report ..... Unit: number

The unit of measurement shall be the number of boreholes regarding which approved reports is compiled. The tendered rate shall be fully inclusive of the work required to compile and produce six copies of each borehole recommendation report.

(f) Reinstallation of existing pumping equipment..... Unit: number

The unit of measurement shall be the number of boreholes in which removed equipment is re-installed. The tendered rate shall cover the reinstallation of existing pumping equipment in a borehole following test pumping of the borehole. The existing pumping equipment shall be reinstalled and left in working condition as it was found before removal unless the Contractor is instructed otherwise by the Engineer.

EA.02 **CLEAN AREA AROUND BOREHOLE**..... Unit: number

The unit of measurement shall be the number of boreholes around which the area is cleaned and levelled.

The tendered rate shall cover full compensation for the cleaning of an area 10 m x 10 m around each borehole.

EA.03 **SERVICING OF EQUIPMENT**

EA.03.01 **De-commissioning and removal of submersible pumping equipment** ..... Unit: number

The unit of measurement shall be the number of submersible pumps and motors de-commissioned and removed.

The tendered rates shall include full compensation for tools, transport, site handling and labour necessary for the complete de-commissioning and removal of pumping equipment.

EA.03.02 **Servicing of submersible borehole pumps**..... Unit: number

The unit of measurement shall be the number of pumps serviced. The tendered rate shall include full compensation for servicing (including all consumables), cleaning, corrosion protection (including pump and motor base), adjusting, aligning, including disassembling and re-assembling. The tendered rate shall include all labour, tools, equipment and spare parts that form part of servicing as set out in the operating and maintenance manuals or as specified by the supplier.

EA.03.03 **Reconditioning of pumping equipment**..... Unit: number

The unit of measurement shall be the number of pumps and motors reconditioned.

The tendered rates shall include full compensation for replacement of components and materials and for, tools, transport, site handling and labour necessary for the complete reconditioning of pumping equipment to conform to all the requirements in this document.

EA.03.04 **Commissioning**..... Unit: number

The unit of measurement shall be the number of borehole installations commissioned.

The tendered rate shall include full compensation for all labour and equipment supplied and for the re-installation and commissioning of each borehole installation.

TECHNICAL SPECIFICATION

EG SEPTIC TANKS

CONTENTS

EG 01 SCOPE

The following maintenance tasks shall be performed on instruction by the Engineer:

- Prepare temporary sludge disposal facility – the more appropriate of the following:
  - Drying bed/pond (approved by Engineer).
  - Carting to nearby sewage treatment works or domestic sanitary landfill site.
- Install permanent sewage by-pass facility consisting of a pre-fabricated tank of appropriate volume (c. $1m^3$ for single dwelling, larger for communal facilities) parallel to the ST, with up- and downstream connecting pipes and plugs.
- Install rodding eyes for regular cleaning of connecting pipes, particularly those between the ST and FD.
- Using a stirrer, pump and/or bacterial aids, break up scum and sludge layers and suspend tank content to enable its pumping.
- Empty tank by means of pumping – retain seed sample for re-commissioning of tanks. Remove large settled objects, such as bricks, etc. Operate by-pass tank during emptying and re-commissioning of main tank.
- Clean connecting pipes and accessories, e.g. in/outlet tees. Remove tree and grass roots from pipes.
- Maintain acceptable aesthetic conditions re smells and spillages during the cleaning cycle.

EG 02 MEASUREMENT AND PAYMENT

EG.01 DESLUDGE AND CLEANING OF SEPTIC TANK..... Unit : Number (no)

The unit of measurement shall be for the procedure described in EG 01 as well as for site specific requirements to achieve a clean and operational septic tank.

The unit of measurement shall be the number of the septic tanks desludged and cleaned as per the procedure described in the specifications as well as for site specific requirements to achieve a clean and operational septic tank.

The tendered rate shall include full compensation for cleaning, excavation, installation, removing of obsolete material and rubble, dealing with water logged conditions, provision of backfill and by-pass tanks and pipes and the disposal of sludge and surplus material to an approved off-site wastewater treatment works. All labour shall also be included in the tendered rate.

TECHNICAL SPECIFICATION

EJ WASTEWATER AND POTABLE WATER QUALITY MEASUREMENT AND TESTING

CONTENTS

EJ 01 SCOPE

This specification covers requirements for effluent standards and potable water quality, as well as testing procedures and equipment to verify these standards.

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

EJ 02 STANDARD SPECIFICATIONS

EJ 02.01 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:

SANS 241:2006	-	Water quality tests
SANS 5667-2	-	Water quality sampling, part 2: Guidance on sampling techniques
SANS 5667-2	-	Water quality sampling, part 10: Guidance on sampling of wastewater (when available)
SANS 5011	-	Water - pH value
SANS 5217	-	Water - free and saline ammonia content
SANS 6048	-	Water - chemical oxygen demand
SANS 6049	-	Water - suspended solids content
SANS 6057	-	Electrical conductivity of water
SANS 4831	-	Microbiology: General guidance for the enumeration of coliforms: Most probable number technique
SANS 4833	-	Microbiology: General guidance for the enumeration of coliforms: Colony count technique at 30 °C

EJ 03 TEST METHODS

EJ 03.01 SETTLEABLE SOLIDS CONTENT

Imhoff tests shall be carried out on the water flowing out of primary settling tanks.

EJ 03.02 **pH VALUE OF WATER**

pH shall be tested on site. The contractor shall be responsible for maintaining the apparatus for measuring pH and shall take measurements as often as necessary. The pH of sewage final effluent shall be in range of 5.5 to 9.5 and that of potable water shall be in the range of 5.5 to 9.5

The addition of chemicals (lime to increase the pH and carbon dioxide or acids to decrease the pH) shall be used to achieve the pH limits.

EJ 03.03 **NITROGEN CONTENT OF WATER**

An approved testing authority shall measure ammonia content of water. The effluent sample shall be submitted to the testing authority according to prescription.

The value of ammonia (ionised and un- ionised) in the final effluent shall not be more than 6 mg/litre. The value of nitrate/nitrite shall not be more than 15 mg/l.

EJ 03.04 **CHEMICAL OXYGEN DEMAND OF WATER**

An approved testing authority shall measure the chemical oxygen demand of final effluent. The effluent sample shall be submitted to the testing authority according to prescription.

The value of chemical oxygen demand in the effluent shall not exceed 30 mg/litre.

EJ 03.05 **SUSPENDED SOLIDS CONTENT OF WATER**

An approved testing authority shall measure the suspended solids content of final effluent. The effluent sample shall be submitted to the testing authority according to prescription.

The value of suspended solids in the effluent shall not exceed 10 mg/litre.

EJ 03.06 **ELECTRICAL CONDUCTIVITY OF WATER**

The value of electrical conductivity shall be tested on site. The Contractor shall be responsible for maintaining the apparatus for measuring the value of electrical conductivity and shall take measurements as often as necessary. The limit value of electrical conductivity in the effluent shall not exceed 50 mS/m above background receiving water, to a maximum of 100 mS/m.

EJ 03.07 **SETTLEABLE SOLIDS**

The Contractor shall measure the value of settleable solids daily. A spot sample of the water flowing into the settled sewage sump shall be taken. The sample shall be left to settle for 45 minutes and then stirred with a glass stirrer.

The sample shall be left to settle for exactly 15 minutes and the value of settleable solids determined. The value of settleable solids shall not exceed 0,4 millilitre/litre. The Contractor shall make use of this test to adjust the sludge withdrawal rate from primary sedimentation tanks.

EJ 03.08 **ORTHO-PHOSPHATE AS PHOSPHORUS**

An approved testing authority, such as SABS, shall measure the ortho-phosphate content of final effluent. The effluent sample shall be submitted to the testing authority according to prescription.

The value of ortho-phosphate (as P) in the effluent shall not exceed 10 mg/litre.

EJ 03.09 FREE AND SALINE AMMONIA CONTENT OF WATER

An approved testing authority, such as the SABS, shall measure ammonia content of water. The effluent sample shall be submitted to the testing authority according to prescription.

The value of ammonia in the final effluent shall not be more than 2 mg/litre.

EJ 03.10 FAECAL COLIFORM COUNT

No provision is made under this Contract for disinfection of water, and the value of faecal coliform counts will not be considered as a performance indicator. However, the value of faecal coliforms shall be determined and recorded monthly.

EJ 04 DETAIL OF WORK

EJ 04.01 GENERAL

As part of the operational responsibilities on this project the Contractor shall regularly test water and effluent quality as well as potable water as specified.

Operation shall include maintaining all testing equipment, including equipment not supplied as part of the contract, in a clean and perfect functional condition.

EJ 04.02 TEST LABORATORY

The existing building shall be utilised as a site laboratory. Should the Contractor require more storerooms or store space, it shall be provided at his cost.

EJ 04.03 TEST EQUIPMENT

The following equipment shall be supplied (where specified in the schedule of quantities) cleaned and tested. Should any equipment be unserviceable or beyond repair it shall be replaced as part of this Contract:

Wastewater Effluent Testing Equipment:

(a) Bench top potentiometer, accurate and precise to at least 0,1 pH unit, including reference electrode and glass sensor or combination electrode;
(b) Electrical conducting meter, with error not exceeding 1 % or 0,1 m S/m;
(c) Thermometer covering the range 23 °C < T < 27 °C accurate and capable of being read to the nearest 0,1 °C;
(d) Magnetic stirrer with PTFE (Teflon) stirring bars;
(e) 3 x 1 000 millilitre Imhoff cones with wooden rack;
(f) 5 x 1 000 millilitre glass bottles with ground stopper;
(g) 2 x 500 millilitre volumetric flasks;
(h) 1 x 1 000 millilitre volumetric flasks;
(i) 3 x pipettes (glass);
(j) 3 x burettes (glass).
(k) Turbidity meter.

Water Testing Equipment:

(a) Bench top potentiometer, accurate and precise to at least 0,1 pH unit, including reference electrode and glass sensor or combination electrode;
(b) Electrical conducting meter, with error not exceeding 1 % or 0,1 m S/m;
(c) Turbidity meter

EJ 05 TESTING BY AUTHORITIES

EJ 05.01 POTABLE WATER QUALITY TESTS

An approved testing authority, such as the SABS, shall measure the content of the potable water monthly (or as instructed for by the Engineer). The sample shall be submitted to the testing authority according to prescription. The water distributed to consumers shall comply with the SANS 241:2006 Specification for the standards of drinking water. Only class 1 (recommended operational limit) water shall be distributed for human consumption. The following analysis shall be performed by an approved authority on at least a monthly basis on the water delivered to the consumers.

The following analysis shall be performed by an approved authority on at least a monthly basis on the water delivered to the consumers in the following prescribed format:

SANS 241:2006	Unit	Class 1 (recommended values)
Chemical report		
pH		5.5 tot 9.5
Electrical conductivity	mS/m	150
Calcium as Ca	mg/L	150
Magnesium as Mg	mg/L	70
Sodium as Na	mg/L	200
Potassium as K	mg/L	50
P-Alkalinity	mg/L	
M-Alkalinity	mg/L	
Fluoride as F	mg/L	1
Chloride as Cl	mg/L	200
Bromide as Br	mg/L	**3
Nitrate as N	mg/L	10
Phosphate as PO_4	mg/L	
Sulphate as SO_4	mg/L	400
Calcium Hardness	mg/L	375
Magnesium Hardness	mg/L	287
Total Hardness as $CaCO_3$	mg/L	662
Total Dissolved Solids	mg/L	1050
Aluminium as Al	mg/L	0.300
Arsenic as As	mg/L	0.010
Chromium as Cr	mg/L	0.100
Copper as Cu	mg/L	1.000
Iron as Fe	mg/L	0.200
Manganese as Mn	mg/L	0.100
Lead as Pb	mg/L	0.020
Zinc as Zn	mg/L	5.000
Bacterial report		
Heterotrophic plate count	cfu/ml	100
Total coliform	cfu/100ml	0
E. coli	cfu/100ml	0

EJ 05.02 **WASTE WATER EFFLUENT QUALITY TEST**

The final effluent of the sewage treatment plant shall comply with the general limit of the General Authorizations (Government Notice 399 of 26 March 2004) in terms of Section 39 of the water Act, 1998 (Act No. 36 of 1998

The following analysis shall be performed by an approved authority on a monthly basis on the final effluent of the sewage works.

- Faecal coliforms (per 100ml)
- Chemical Oxygen demand (mg/l)
- pH
- Ammonia as Nitrogen (mg/l)
- Nitrate as nitrogen (mg/l)
- Chlorine as free chlorine (mg/l)
- Suspended solids (mg/l)
- Electrical conductivity (mS/m)
- Ortho-phosphate as phosphorus (mg/l)

EJ 06 **MEASUREMENT AND PAYMENT**

EJ.01 **POTABLE WATER QUALITY TESTS**.....Unit: number (no)

The unit of measurement for the potable water quality tests shall be the number of completed tests performed *by an authorised testing authority* as per SANS 241 as detailed in specification EJ.05.01

The tendered rate shall include full compensation for sampling, testing, transport and reporting to the Engineer.

EJ.02 **WASTEWATER EFFLUENT QUALITY TESTS** .....Unit: number (no)

The unit of measurement for the wastewater effluent quality tests shall be the number of completed test sets performed *by an authorised testing authority* as detailed in specification EJ.05.02

The tendered rate shall include full compensation for sampling, testing, transport and reporting to the Engineer.

TECHNICAL SPECIFICATION

EN LICENSING OF WATER USE AND REGISTRATION OF WATER WORKS

CONTENTS

EN 01 SCOPE

This specification covers the Licensing of a water use and registration of a water works which are two separate activities that must be adhered to by the owner of the land on which a water works and is constructed and operated.

EN 02 LICENSING OF A WATER USE (BOTH DRINKING WATER AND WASTEWATER)

The National Water Act, 1998 (Act 36 of 1998) regulates the use of water. Various uses of water were identified and were taken up in the Water Act as activities which must be licensed by the Department of Water and Environmental Affairs (DWAE) unless:

- it is listed in Schedule I
- it is an existing lawful use
- it is permissible under the General Authorisations; or
- if the responsible authority waives the need for a license

Regulation No. R. 1352 issued in terms section 26(1) (c) of the Water Act, 1998 includes all water uses (i.e. existing lawful water uses in terms section of 34(2) of the Water Act, 1998 as well as general authorisations in terms of section 29 (1)(b)(vi) of the Water Act,1998).

In section 21 of the National Water Act a water use is defined as the following:

- taking water from a water resource
- storing water
- impeding or diverting the flow of water in a water course
- engaging in a stream flow reduction activity (as in section 36 of the National Water Act)
- engaging in a controlled activity identified as such in section 37 (1) or declared under section 38(1) of the National Water Act
- discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit
- disposing of waste in a manner which may detrimentally impact on a water resource

- disposing in a manner of water which contains waste from, or which has been heated in, any industrial or power generating process
- altering the bed, banks, course or characteristics of a water course
- removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
- using water for recreational purposes

EN 03 REGISTRATION OF A WATER WORKS (BOTH DRINKING WATER AND WASTEWATER)

The registration of water works, whether it is a drinking water purification plant or a wastewater treatment plant, is a regulatory requirement which must be adhered to as stipulated by the National Water Act,1998 (Act No. 36 of 1998).

In terms of Regulation R2834 dated 27 December 1985 which was issued in terms of the Water Act of 1956, a **water works and the operators** (process controllers) must be registered after classification of the water works at the relevant authority which is the Department of Water and Environmental Affairs (DWAE).

Regulation R2834 is now under revision and it is still valid. Draft regulations were published under both the Water Services Act, 1997 (Regulation No. R.17 of 2008) as well as the Water Act, 1998 (Regulation No. R.180 of 24 February 1998).

EN 04 COMPULSORY NATIONAL STANDARDS AND MEASURES TO CONSERVE WATER (REGULATION R.509 OF 8 JUNE 2001) (DRINKING WATER ONLY)

Regulation R.509 of 8 June 2001 was issued in terms of the Water Services Act, 1997 (Act No. 108 of 1997). The regulation is inter alia related to compulsory national standards for drinking water.
The quality of drinking water is by law regulated by two standards:

- The South African National Standard 241:2006 Edition 6.1; or
- The South African Quality Guidelines Published by the Department of Water and Environmental Affairs.

Results from testing samples must be compared to the specified limits and it must then be identified whether the water tested, poses a health risk or not. Should the water poses a health risk the water services institution must inform the relevant authorities (Department of Water and Environmental Affairs and the Provincial Department of Health) and it must take steps to inform the consumers of the following:

- that the water supplied poses a health risk
- of the reasons of the health risk
- of precautions to be taken by the consumers
- of the time frame, if any, within which it may be expected that water of a safe quality will be provided.

EN 05 POLLUTION PREVENTION (WASTEWATER AND DRINKING WATER)

In terms of section 19 of the National Water Act,1998 (Act No. 36 of 1998) the prevention of pollution of land and water resources is the responsibility of the person who owns or uses the land.

In a situation where pollution of land or water resources occurs or might occur the person who owns, controls, occupies or uses the land is responsible for taking measures to prevent pollution of water resources. If measures are not taken the relevant authority may do whatever it takes to prevent or remedy the situation and then recover the costs from the persons responsible for the pollution.

Section 19 of the National Water Act,1998 (Act No. 36 of 1998) reads as follows:

19. *(1) An owner of land, a person in control of land or a person who occupies or uses the land on which-*

(a) any activity or process is or was performed or undertaken; or
(b) any other situation exists, which causes, has caused or is likely to cause pollution of a water resource, must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring.
(2) The measures referred to in subsection (1) may include measures to-
(a) cease, modify or control any act or process causing the pollution;
(b) comply with any prescribed waste standard or management practice;
(c) contain or prevent the movement of pollutants;
(d) eliminate any source of the pollution;
(e) remedy the effects of the pollution; and
(f) remedy the effects of any disturbance to the bed and banks of a watercourse.
(3) A catchment management agency may direct any person who fails to take the measures required under subsection (1) to-
(a) commence taking specific measures before a given date;
(b) diligently continue with those measures; and
(4) Should a person fail to comply, or comply inadequately with a directive given under subsection (3), the catchment management agency may take the measures it considers necessary to remedy the situation.
(5) Subject to subsection (6), a catchment management agency may recover all costs incurred as a result of it acting under subsection (4) jointly and severally from the following persons:
(a) Any person who is or was responsible for, or who directly or indirectly contributed to, the pollution or the potential pollution;
(b) The owner of the land at the time when the pollution or the potential for pollution occurred, or that owner's successor-in-title;
(c) The person in control of the land or any person who has a right to use the land at the time when-
(i) the activity or the process is or was performed or undertaken; or
(ii) the situation came about; or
(d) Any person who negligently failed to prevent-
(i) the activity or the process being performed or undertaken; or
(ii) the situation from coming about.
(6) The catchment management agency may in respect of the recovery of costs under subsection (5), claim from any other person who, in the opinion of the catchment management agency, benefited from the measures undertaken under subsection (4), to the extent of such benefit.
(7) The costs claimed under subsection (5) must be reasonable and may include, without being limited to, labour, administrative and overhead costs.
(c) If more than one person is liable in terms of subsection (5), the catchment management agency must, at the request of any of those persons, and after giving the others an opportunity to be heard, apportion the liability, but such apportionment does not relieve any of them of their joint and several liability for the full amount of the costs.

EN 06 MEASUREMENT AND PAYMENT

EN.01 **REGISTRATION OF A WATER USE** ..... Unit : Number

The unit of measurement shall be the number of potable water and sewage treatment plants to be registered. Boreholes are registered as single units. Separate forms are necessary for individual properties, as it is registered at the Surveyor General under its own title dead number. Multiple boreholes on the same property can be registered on the same form by using a summery of the location of each borehole.

The tendered rates shall include full compensation to obtain all relevant information from different authorities (Surveyor General, for instance) to complete the forms. It shall also include full compensation to complete and dispatch the application forms, and ensure that registration is completed on behalf of the Department of Public Works.

TECHNICAL SPECIFICATIONS

FD HEATING VENTILATION AND AIRCONDITIONING SYSTEMS

CONTENTS

FD 01 SCOPE

This specification covers the general repair and maintenance of heating, ventilation and air-conditioning systems, which include the following:

(a) Room air-conditioning units with air cooled condensers
(b) Refrigeration pipework
(c) Electric motors
(d) Air filters
(e) Noise and vibration
(f) Painting and cleaning
(g) Labeling and identification.

This specification shall form an integral part of the repair and maintenance 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 and, in the event of any discrepancies between the Technical Specification and the Particular Specification, the latter shall take precedence.

The Contractor shall at all times adhere to this specification, unless otherwise specified in the Particular Specification.

FD 02 STANDARD SPECIFICATIONS

FD 02.01 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 deemed to form part thereof:

FD 02.01.01 SANS and other specifications and codes

SANS 046	-	Copper tube manufacturing code of practice
SANS 10400	-	The applications of the National Building Regulations
SANS 10103	-	The measurement and rating of environmental noise with respect to annoyance and speech communication
SANS 10140	-	Identification colour marketing
SANS 10142-1	-	Code of practice for the wiring of premises
SANS 10147	-	Refrigerating systems, including plants associated with air-conditioning systems
SANS 10173	-	Installation, testing and balancing of air-conditioning duct work
SANS 630	-	Decorative high-gloss enamel paint
SANS 763	-	General coating thickness
Act 103	-	National Building Regulations and Building Standard Act, 1977 (Act No 103 of 1977) as amended

FD 02.01.02 Department of Public Works Specifications

OWG 371	-	Specification of materials and methods to be used
STS 1	-	Standard specification for air conditioning services
STS 5	-	Standard specification for electrical installations and Equipment pertaining to mechanical installations

FD 02.01.03 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 25207 and Regulation Gazette No 7721 of 18 July 2003 shall be adhered to.

FD 02.01.04 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.

FD 02.01.05 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.

FD 03 VARIATIONS AND ADDITIONS TO STANDARD SPECIFICATIONS

The following additional general specifications and requirements shall be read in conjunction with this specification and shall be adhered to unless otherwise specified in the Particular Specification.

FD 03.01 GENERAL REPAIR AND INSTALLATION REQUIREMENTS

(a) All materials and equipment supplied and installed shall be of new high quality, design and manufactured to the relevant specifications, suitable for providing efficient, reliable and trouble-free service.

(b) All work shall be executed in a first-class workman-like manner by qualified tradesmen.

(c) All equipment, component parts, fittings and materials supplied and/or installed, shall conform in respect of quality, manufacture, test and performance to the requirements of the applicable current SANS specifications and codes, except where otherwise specified or approved by the Engineer in writing.

(d) All materials and workmanship which, in the opinion of the Engineer, is inferior to that specified for the work will be condemned. All condemned material and workmanship shall be replaced or rectified as directed and approved by the Engineer.

(e) The Contractor shall submit a detailed list of the equipment and material to be used to the Engineer for approval before placing orders or commencing installation.

(f) All new equipment, materials and systems shall be installed and positioned such as to not impede on access routes, entrances and other services. The Contractor shall coordinate these items taking other services and equipment into account.

(g) All control equipment and serviceable items shall be installed and positioned such that they will be accessible and maintainable.

(h) The Contractor shall make sure that all safety regulations and measures are applied and enforced during the repair and construction periods to ensure the safety of the public and User Client.

(i) Repair work shall be programmed in accordance with Additional Specification SC: General Decommissioning, Testing and Commissioning Procedures, to ensure the shortest possible down-time of any service and the least inconvenience to the User Client and public. The Contractor shall make sure that the necessary notifications and notices are timeously put into place for these activities.

FD 03.02 **TESTING OF REFRIGERATION PIPING AND EQUIPMENT**

(a) All new refrigerant pipe installations shall be thoroughly tested to be sure that they are absolutely tight. Nitrogen must be used to pressure test the system at 1,5 times the working pressure. A pressure-reducing valve must be used to set the test pressure. A leak test must be carried out on the entire system.

(b) All new refrigerant pipe installations shall be vacuum pumped by means of a suitable vacuum pump. An absolute pressure of 2500 micron must be reached. Allow the system to stand under vacuum for a minimum of 12 hours. If no noticeable rise in pressure has taken place after 12 hours, the system may be charged.

(c) The dryness of the refrigeration system shall be indicated by an approved moisture indicator.

(d) Should moisture be present, the system shall be leak tested and the leak repaired. Should no leak be present, the system shall be flushed with dry nitrogen and vacuum pumped again as described above.

(e) If the completed system complies with all the Specifications and passes the test and inspection, it can be approved and the Contractor may be instructed to recharge the system with the correct refrigerant and refrigerant charge.

(f) Under no circumstances shall the refrigerant piping/installation be purged.

FD 03.03 **REFRIGERANTS**

(a) No CFC refrigerant shall be used in new installations.

(b) Equipment still running on CFC shall be removed once a defect has been detected and replaced with R410a as described in the Montreal Protocol and recommended by the compressor manufacturer.

(c) Any CFC refrigerant that has to be discharged, shall be decanted by means of an approved reclaiming system, and not discharged to the atmosphere. Should the Contractor not comply with this requirement, full action shall be taken contractually and statutory against him/her.

(d) Any refrigeration system not supplied with three-way service valves, shall be provided with Schreuder type service valves. These valves shall be installed on both suction and discharge lines of the compressors. Tap-o-line valves shall not be fitted or used on the systems.

(e) In the event of an electrical motor burn-out in a hermetic or semi-hermetic compressor, a burn-out drier shall be used. Purging only is prohibited. The burn-out drier shall be installed and removed as per the manufacturer's instructions.

(f) No synthetic components or solutions shall be used to repair leaks in refrigeration piping, on coils or evaporators. Only approved gas welding shall be used. Should the leak be of such nature that repair is not possible, the item should be replaced.

FD 03.03.01 **Primary filters**

(a) Primary filters shall, unless otherwise stated, be washable on woven polyester material, pleated to provide an extended surface with a dust spot efficiency of minimum 40 % and an arrestance of 85 %.

(b) Media shall be firmly held in place by rustproof wire screens to maintain pleat strength and spacing.

(c) Media and support screens shall be continuously bonded into aluminium support.

(d) Frames shall be folded to form a robust media support frame. The bonding between media and frame shall be continuous to prevent leakage.

(e) Each filter shall be provided with a factory made holding frame, constructed of not less than 1,0 mm thick galvanized mild steel provided with suitable seals and quick release spring type clips to securely hold the filter cell in place without permitting leakage of air.

(f) The holding frames of multiple cell filter banks shall be suitably joined and sealed so as to prevent leakage of air between the frames.

FD 03.04 **LABELLING AND IDENTIFICATION**

All equipment shall be labelled and identified using black Traffolite labels with 10 mm high white lettering on the labels. Labels will be secured using epoxy base glue.

The identification number used on these labels shall correspond with the equipment number on the complete inventory list.

FD 03.05 NOISE AND VIBRATION

(a) Particular care shall be taken in the selection, application and installation of all equipment used to ensure that the equipment will operate below the required noise level for public areas of NC 35 and with the least vibration possible, all to the satisfaction of the Engineer.

(b) Equipment shall be mounted on vibration isolators of the correct type and selection depending on deflection requirement and vibrating frequency.

(c) The subcontractor shall provide sound level data to the Engineer on the completion of the installation detailing the noise levels in NC level for each separate area. No measurement shall be taken closer than 1 metre from any outlet.

FD 03.06 PAINTING AND CLEANING

(a) No untreated metal surfaces shall be allowed on the project. Items which are not galvanized or similarly protected against rust and corrosion shall be painted as detailed below. No equipment, hangers, brackets, etc, shall be delivered to site in unprotected condition; they shall be factory coated with an approved zinc-rich prime coat before being dispatched.

(b) Painting shall comprise the following consecutive processes. Thoroughly clean, descale and degrease all surfaces, apply one coat of approved zinc-rich primer and one coat of universal undercoat, and finish off with two coats of quality high-gloss enamel. Final finish shall be to the full approval of the Engineer.

(c) Items with galvanized finish, such as cable trays, need not be painted but shall be properly cleaned with suitable galvanized iron cleaning fluid. Where galvanized finish is painted, it shall be primed with a calcium plumbate primer.

(d) It is not a requirement to paint duct work, conduits or pipework installed in roof voids and shafts, where they are not visible, if they are galvanized. Items as mentioned above shall be properly cleaned and painted as specified above.

(e) Plant and equipment shall be painted with the relevant colour in accordance with SANS.

FD 03.07 SELF-CONTAINED AIR-CONDITIONING UNITS

(a) The self-contained packaged unit shall be a fully catalogued product and documentation shall include performance curves and selection tables.

(b) Self-contained room air-conditioning units consist of unit casing, compressor, evaporator and fan, condenser and fan, refrigerant pipework with expansion device and the relevant controls. The condenser unit shall form an integral part of the unit or be separate for split applications.

(c) Unit casings shall be of sheet metal construction with a baked enamel finish to give a corrosion resistance. Units shall be suitably insulated to ensure quiet operation.

(d) Evaporator fans shall be of the double inlet centrifugal type with integral motor or belt-driven. The fan assembly shall be isolated from the unit by means of rubber mounts and the unit shall operate without vibration.

(e) Condensate trays shall be manufactured of non-corrosive materials and shall be insulated and condensate shall be piped to the nearest drain point.

(f) Washable WP 77 filters shall be provided and installed behind the inlet grille and shall be easily removable.

(g) Compressors shall be of the hermetically sealed dome type with crankcase heaters and suitable vibration isolators.

(h) Condenser coils shall be copper tubes with aluminium fins for inland use. Condenser fans shall be propeller fans or of the centrifugal type.

(i) Refrigerant piping shall be installed and repaired as specified in FD 03.

FD 04 AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS

The Contractor shall be responsible for the compilation of an inventory list and operating and maintenance manuals and system data sheets.

This shall be done in accordance with Additional Specification SB: Operating and Maintenance Manuals.

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

All information shall be recorded and reproduced in electronic format, as well as three sets of hard copies to be supplied to the Department.

Over and above what is specified in Additional Specification SB: Operating and Maintenance Manuals, the operating and maintenance manual to be compiled shall be structured to include at least the following:

(a) System description

Complete system description and the working of the equipment.

(b) Commissioning data

Complete commissioning, test and inspection data of plant.

(c) Operating data

(i) Plant running check list and frequency of servicing required;
(ii) Safety precautions to be implemented;
(iii) Manual and automatic operation;
(iv) Maintenance duties and logging required;
(v) Lubricating oils and service instructions;
(vi) Pre-start checklist for each system;
(vii) Starting and stopping procedures.

(d) Mechanical equipment

(i) Description of all major items with the make, model number, names, addresses and telephone numbers of the suppliers, manufacturers or their agents;
(ii) Design capacities of all equipment, including selection parameters, selection curves, capacity tables, etc;

(iii) Manufacturers' brochures and pamphlets;
(iv) Schedule of spares with part numbers recommended to be held as stock.

(e) Maintenance instructions

(i) Schedule of maintenance particulars, frequency of services and replacements;
(ii) Trouble-shooting guide;
(iii) Part number of all replacement items and spares;
(iv) Capacity curves of pumps, fans and compressors;
(v) Serial numbers of all items of equipment.

(f) Electrical equipment

(i) Schedule of equipment, indicating manufacturer, type, model number, capacity and addresses and telephone numbers of suppliers;
(ii) Maintenance instructions;
(iii) Manufacturers' brochures and pamphlets;
(iv) Complete as-built circuit diagrams and diagrammatic representation of interconnections of all electrical equipment.

(g) Instrumentation and control

(i) Description of each control system;
(ii) Schedule of control equipment indicating manufacturer, type, model number, capacity and addresses and telephone numbers of suppliers;
(iii) Maintenance instructions;
(iv) Manufacturers' brochures and pamphlets.

(h) Drawings

(i) Paper prints of all as-built mechanical and electrical drawings;
(ii) Wiring diagrams framed behind glass shall be mounted adjacent to each relevant control panel.

FD 05 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 operations, faults, system checks, breakdowns, maintenance visits, inspections, etc.

The logbook shall be kept in a safe place at the maintenance section and shall only be utilised by the boiler house supervisor, the Contractor and the Engineer. A copy of the monthly entries and recordings into this logbook shall be submitted by the Contractor together with this monthly report to the Engineer.

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

(i) Daily inspection and maintenance actions;
(ii) Monthly inspection and maintenance actions;
(iii) Six-monthly inspection and maintenance actions;
(iv) Breakdown reports.

The Contractor shall also institute an attendance register, which shall be kept in a safe place at the maintenance section. This register shall be completed by all persons visiting the relevant plants, including:

(a) Contractor and maintenance personnel;

(b) Inspectors;
(c) User Client and associates;
(d) Engineer.

This 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.

On completion of repair work and/or the installation of new equipment the plant and equipment shall be put into operation after all tests and adjustments have been carried out to the satisfaction of the Engineer. Where new plant is installed the Contractor shall run and operate the system for a period of time specified by the Engineer and train the staff of the User Client to operate and maintain the system. This operation shall be done strictly in accordance with Clause SC 11 of the Additional Specification SC: General Decommissioning, Testing and Commissioning Procedures.

Logging of the operation of the installations shall commence immediately upon start-up.

The Contractor shall submit a full commissioning report as per attached commissioning data sheet.

FD 06 TESTS AND INSPECTIONS ON COMPLETION OF REPAIR WORK

On completion of repair work the Contractor shall prior to re-commissioning test the plant and its equipment. This operation shall be done strictly in accordance with Clause SC 08 of Additional Specification SC: General Decommissioning, Testing and Commissioning Procedures.

Except where otherwise provided in the Contract, the Contractor shall provide labour, materials, power, fuel, accessories and properly calibrated and certified instruments necessary for carrying out such tests. Arrangements for these tests shall be made by the Contractor and he shall give at least 72 hours written notice to the Engineer before commencing the test.
In the event of the plant or installation not passing the test, the Employer shall be at liberty to deduct from the Contract amount all reasonable expenses incurred by the Employer or the Engineer attending the repeated test.

Whenever any installation or equipment is to be operated for testing or adjusting as provided for above, the Contractor shall operate the entire system for as long a period as may be required to prove satisfactory performance at all times in the occupies space served by that system for up to twenty-four hours a day continuously until the certificate of practical completion of repair work is handed over.

The Contractor shall provide all labour and supervision required for such operation and the Department may assign staff as observers, but such observation time shall not be counted as instruction time.

After complete installation of the system all equipment shall be tested, adjusted and readjusted until it operates to the satisfaction and approval of the Engineer.

The Contractor shall submit certificates of tests carried out to prove the performance of all equipment, as well as certificates obtained from all the relevant authorities and statutory bodies, etc.

The Contractor shall only utilize Departmental approved inspection authorities for all inspections and tests to be conducted. This will be done and approved in writing among the relevant parties.

FD 07 QUALITY ASSURANCE SYSTEM

The Contractor shall institute an approved quality assurance (QA) system, which shall be submitted to the Engineer for his approval. The records of this QA system shall be kept throughout the duration of the Contract and be submitted to the Engineer at regular intervals as required.

FD 08 COMMISSIONING AND RECOMMISSIONING OF EQUIPMENT AND INSTALLATION

FD 08.01 GENERAL

On completion of repair work and/or the installation of new equipment, the equipment shall be put into operation after all tests and adjustments have been carried out to the satisfaction of the Engineer. Where new equipment is installed the Contractor shall run and operate the system for a period of time as specified by the Engineer and train the staff of the User Client to operate and maintain the system. This operation shall be done strictly in accordance with Clause SC 11 of Additional Specification SC: General Decommissioning, Testing and Commissioning Procedures.

Logging of the operation of the installations shall commence immediately upon start-up.

The Contractor shall submit a full commissioning report as per attached commissioning data sheet.

FD 08.02 RECOMMISSIONING OF ANCILLARY EQUIPMENT

On completion of repair work the Contractor shall recommission the equipment. This operation shall be done strictly in accordance with Clause SC 11 of Additional Specification SC: General Decommissioning, Testing and Commissioning Procedures. This operation shall also be carried out strictly in accordance with the manufacturer's specification and shall be witnessed by the Engineer.

Recommissioning checks to be carried out shall be categorised under the following headings:

(a) Mechanical checks
(b) Electrical and control checks.

On completion of repair work the Contractor shall recommission the ancillary equipment. This operation shall be done strictly in accordance with the manufacturer's specification and shall be witnessed by the Engineer. This shall include but not be limited to the following:

(a) All required recommissioning mechanical checks

(i) Check system for leaks;
(ii) Check rotation of all fans; Check mountings of all equipment.

(b) All required re-commissioning electrical and control checks

(i) Check all wiring connections for tightness and repair any hot connections.

(ii) Check that all electrical equipment have been properly reconnected in accordance with the manufacturer's specification.

(iii) Perform and record all required electrical insulation tests on equipment.

(iv) Check and test all controls with main circuits isolated.

(v) Check all motor-driven equipment for correct rotational directions.

(vi) Check and test the operation of all indication and warning lights.

(vii) Check, set, record and readjust all equipment control and set points in accordance with manufacturer's specification.

(viii) Run all motor-driven equipment for a period to ensure free movement and correct operation, feed pumps only to be operated for a short interval to check rotation.

FD 08.03 COMMISSIONING AND COMPLETION OF REPAIRS

On completion of the re-commissioning checks the Contractor shall proceed with the commissioning. This operation shall be done strictly in accordance with Clause SC 11.02 of Additional Specification SC: General Decommissioning, Testing and Commissioning Procedures. This operation shall also be carried out in accordance with the manufacturer's specification and shall include but not be limited to the following for the different types of equipment:

FD 08.03.01 Self-contained air-conditioning unit

(a) Check evaporator and condenser pressures and superheat.
(b) If the unit needs charging, find leak, decant, repair leak and recharge unit.

(c) Check fans, fan speed control and fan motors.

(d) Check entering and leaving air temperatures over evaporator coil.

(e) Check operation of all safeties:

(i) LP cut-out pressure
(ii) HP cut-out pressure
(iii) Low on-coil thermostat
(iv) Set point of oil pressure safety
(v) Oil pressure trip.

(f) Check anti-recycle timer.

(g) Check all running amps of fans and compressors.

(h) Check compressor unloading mechanism if applicable.

(i) Complete commissioning data sheet.

FD 09 GUARANTEE OF INSTALLATION AND EQUIPMENT

The Contractor shall provide and obtain guarantees from the manufacturer(s) and/or supplier(s) to the effect that each piece of new equipment, supplied and installed under the repair contract, will comply with the required performance and will function as part of the complete system.

All new equipment, including the complete new installations and the systems as a whole, shall be guaranteed for a period of 12 (twelve) months commencing on the day of issue of a certificate of completion for repair work of the installation.

FD 10 REPAIR WORK TO INSTALLATION SYSTEMS AND EQUIPMENT

FD 10.01 GENERAL

At the start of the repair and maintenance contract all the systems, installations and equipment shall be repaired as specified in the Particular Specification. This repair work shall include but not be limited to the specified Particular Specification details.

All repair work shall be executed using approved materials and equipment suitable to the systems and/or installations they serve. The said repair work shall be executed in accordance with the relevant codes of practice, standard, regulations, municipal laws and by-laws, manufacturer's specifications and codes of practice and all additional and particular specifications included in this document.

The repair work items shall be listed in tabular form in the Particular Specification with all relevant details, such as capacity, size, manufacturer, model number, etc.

All repair work shall be executed within the approved period for repairs to be agreed at the start of the Contract period. All new equipment, materials and systems shall be furnished with a written guarantee of a defects liability period of 12 months from date of issue of a certificate for completion of the repair work. These guarantees shall be furnished in favour of the Department of Public Works. On completion of the required and specified repair work the systems, installations and equipment shall be commissioned and handed over to the satisfaction of the Engineer.

Repair work items shall be categorized for the following installations:

(a) Self-contained air-conditioning units.

FD 10.02 SELF-CONTAINED AIR-CONDITIONING UNITS

(a) Clean air intake screen.
(b) Replace filters.
(c) De-rust, neutralize and touch up paintwork.
(d) Replace canvas collars.
(e) Clean housing, ensure all panels are properly secured and door panels close properly.
(f) Check setting and operation of all pressure switches, reset if required.
(g) Check setting and operation of all safety switches, ie LP and HP switches, oil pressure switch.
(h) Check setting and operation of thermostats.
(i) Check timers and reset if required.
(j) Check operation of seven-day timer.
(k) Check running current of fans and compressor and settings and operation of overloads.
(l) Check tightness of all electrical terminals.
(m) Ensure operation of local and remote isolators.
(n) Check condition of all cables and whether cables are neatly strapped and reposition and strap if required.
(o) Ensure correct operation of emergency stop.
(p) Carry out a leak test on all refrigeration piping and components inclusive of evaporator and condenser.
(q) All leaks shall be repaired. Should a leak on a component be of such a nature that it cannot be repaired, the component shall be replaced. The procedure to follow is as set out in FD 03.

(r) The superheat setting of the thermostatic expansion valve shall be checked and adjusted if required (setting approximately 8 °C).
(s) The filter dryer shall be replaced.
(t) Check compressor vibration mounts.
(u) Test oil acidity.
(v) Check refrigerant charge sight glass being clear or flashing.
(w) Check moisture indication being dry.
(x) Clean condensate tray and test drainage operation.
(y) Clean evaporator and condenser blades and check unbalance.
(z) Replace suction line insulation.
(aa) Check all service valves for full operation, replace caps if missing.

FD 11 MAINTENANCE TO INSTALATION AND EQUIPMENT

FD 11.01 GENERAL

Monthly maintenance responsibilities for each installation including all units and components as specified, shall commence with commencement of the Contract. 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.

This part of the Contract shall include:

(a) Routine preventative maintenance;
(b) Corrective maintenance;
(c) Breakdown maintenance;
(d) Cleaning of filters,

As defined in Additional Specification SA: General Maintenance, for the specified installations described under FD 01 of this specification.

The maintenance work to be performed and executed shall be done strictly in accordance with Additional Specification SA: General Maintenance, and as specified in Particular Specification PFD and this specification.

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 prescribed manufacturer's guarantees.

The maintenance work and items are to be categorized by the Contractor for each maintenance activity under the following headings:

(a) Self-contained air-conditioning units.

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

FD 11.02 DEFINITION AND QUALIFICATION OF ACTIONS

FD 11.02.01 Daily maintenance actions

Daily actions are the responsibility of the User Client. These checks are to be performed by staff responsible of the facility. The self-contained air-conditioning units and ventilation systems should run during working hours and/or continuously. The status of these systems can thus be monitored by observation on a daily routine.

(a) Self-contained air-conditioning units:

-Does the unit perform and maintain temperature?
-Is the temperature in the areas concerned satisfactory?
Is the condensate drain working properly?

These daily checks shall be logged at the facility, ie by the kitchen manager and the maintenance personnel.

FD 11.02.02 Monthly maintenance actions

TABLE FD 11.02.02/1: SELF-CONTAINED AIR-CONDITIONING UNIT

REFERENCE NUMBER	ACTION
S-1	Clean filters, replace if required
S-2	Inspect air intake and discharge for blockages
S-3	Check all refrigerant, drainage pipes for damaged and leaks
S-4	Check sight glass: clear or flash gas
S-5	Carry out visual inspection of condenser coil for blockages and correct operation of fans
S-6	Carry out visual inspection of evaporator coil for blockages and correct operation of supply fan
S-7	Check enclosure for damages
S-8	Check electric motor running temperatures
S-9	Check electric connections for tightness
S-10	Test thermostat and control operation
S-11	Clean condensate tray and test drainage for proper operation
S-12	Check cooling and heating cycle

Note: The monthly actions shall include the activities of the daily maintenance actions.

FD 11.02.03 **biannual maintenance actions**

TABLE FD 11.02.03/1: SELF-CONTAINED AIR-CONDITIONING UNITS

REFERENCE NUMBER	ACTION
S-1	Clean filters, replace if required
S-2	Inspect air intake and discharge for blockages
S-3	Check all refrigerant, drainage pipes for damages and leaks
S-4	Check sight-glass: clear or flash gas
S-5	Carry out visual inspection of condenser coil for blockages and correct operation of fans
S-6	Carry out visual inspection of evaporator coil for blockages and correct operation of supply fan
S-7	Check enclosure for damages
S-8	Check electric motor running temperatures
S-9	Check electric connections for tightness
S-10	Test thermostat and control operation
S-11	Clean condensate tray and test drainage for proper operation
S-12	Check filter/dryer
S-13	Check superheat and functioning of expansion valve
S-14	Check operation of HP and LP switch
S-15	Check operation of controllers
S-16	De-rust, neutralize and touch up paint work
S-17	Check cooling and heating cycle
S-18	Clean evaporator and condenser coil chemically
S-19	Clean all filter frames and seals
S-20	Check fan motor and compressor current
S-21	Check and test overload settings
S-22	Lubricate all bearings

Note: The above biannual actions include the activities of the monthly maintenance actions.

PARTICULAR SPECIFICATIONS

PFD HEATING VENTILATION AND AIR CONDITIONING SYSTEM

CONTENTS

PFD 01 SCOPE

(a) This specification encompasses all aspects regarding the particulars of the repair and maintenance work to the Heating Ventilation and Air-conditioning systems at Monantsa Pass and Peka Bridge. This particular Specification shall be read in conjunction with the Technical Specification FD: Heating, Ventilation and air-conditioning systems and all additional and technical specifications compiled as part of this document, and in particular the following Additional specifications.

SA: General Maintenance

SB: Operating and Maintenance Manuals

SC: General Decommissioning, Testing and Commissioning Procedures

The intended repair and maintenance work to this installation will restore the existing installation to a safe, efficiently functional system that complies with all statutory regulations and applicable standards, in the process repairing all defects and shortfalls. On completion of the repair work, the equipment shall be maintained and serviced by the Contractor for the remainder of the 36-month Contract period.

(b) One of the installations which have to be replaced and maintained under this Contract includes the following equipment and is referred to as Schedule 12:

(i) Twenty eight (28) off existing split unit air conditioning units to invertor types. Two (2) invertor types existing to be maintained.

(ii) 3 Fan heaters to be repaired and maintained.

PFD 02 GENERAL DESCRIPTION OF INSTALLATIONS

(a) The split unit air conditioning units are inside the offices and at the residential area for a cooler working condition for workers, residents, public and the electronic equipment.

PFD 03 TECHNICAL DETAILS OF INSTALLATION

At the time of this document the existing installation consisted of the equipment and plant as listed in the Preliminary design report dated March 2016.

PFD 04 DETAILS OF REPAIR WORK

PFD 04.01 GENERAL DESCRIPTION OF REPAIR WORK

PFD 04.01.01 The Contractor shall at the start of the Repair and Maintenance Contract inspect the items, systems, equipment, components and installations listed below and replace split units with invertor types as specified in the PDR. This inspection shall include the establishing of any defects, leaks, conditions, damages, shortfalls, structural soundness, repairs required, details of existing equipment, suitability of equipment for the purpose it serves, etc. The Contractor shall report back to the Engineer in writing on all the above and the following items. No repair work shall commence prior to approval by the Engineer:

(a) Air-conditioning units;

(b) Support and bracketing system;

(c) Domestic water and drainage installations to equipment;

(d) Electrical supply, wiring to and control of equipment.

PFD 04.01.02 The general scope of repair work to this installation shall at least include, but not be limited to the following. Any items, components, installations and systems not detailed in the Particular Specification shall be repaired and/or replaced if found to be defective and/or inoperative.

(a) Dismantling, stripping, overhauling, repair, service, reassembling, testing and commissioning of all equipment that form part of this installation;

(b) Implementation of a maintenance control plan;

(c) Supplying as-built information and drawings, as well as operating and maintenance manuals for all equipment that form part of this installation.

PFD 04.02 **DETAILS OF REPAIR WORK TO EQUIPMENT**

The following work shall form part of the repair work the heating, Ventilation and Air Conditioning Systems. This work shall be done in accordance with the relevant regulations, codes of practice, specifications and Technical specification FD: Heating ventilation and air conditioning, as set out in this document. The following work shall be included.

PFD 04.02.01 **Self-contained Air-Conditioning Units**

(a) Clean air intake screen.

(b) Replace filters

(c) De-rust, neutralise and touch up paintwork

(d) Replace canvas collars

(e) Clean housing, ensure all panels are properly secured and door panels close properly. Replace panel seals.

(f) Check setting and operation of all pressure switches, reset if required.

(g) Check setting and operation of all safety switches, i.a. LP&HP switches, oil pressure switch.

(h) Check setting and operation of thermostats.

(i) Check timers and reset if required.

(j) Check operation of seven-day timer.

(k) Check running current of fans and compressor and settings and operation of overloads.

(l) Check tightness of all electrical terminals.

(m) Ensure operation of local and remote isolators.

(n) Check condition of all cables and whether cables are neatly strapped and reposition and strap if required

(o) Ensure correct operation of emergency stop.

(p) Carry out a leak test on all refrigeration piping and components inclusive of evaporator and condenser.

(q) All leaks shall be repaired. Should a leak on a component be of such a nature that it cannot be repaired, the component shall be replaced. The procedure to follow is as set out in section FD 03.02

(r) The superheat setting of the thermostatic expansion valve shall be checked and adjusted if required (setting approximately 8°C).

(s) The filter dryer shall be replaced.

(t) Check compressor vibration mounts.

(u) Test oil acidity.

(v) Check refrigerant charge sight glass being clear or flashing.

(w) Check moisture indication being dry.

(x) Clean condensate tray and test drainage operation.

(y) Clean evaporator and condenser fan blades and check unbalance.

(z) Replaced suction line insulation.

(aa) Check all service valves for full operation, replaced caps if missing.

PFD 05.01 **HEATING VENTILATION AND AIRCONDITIONING SYSTEM REPAIR WORK: MEASUREMENT AND PAYMENT**

Item			Unit
PFD	05.01.01	**Service AC units**	No

The unit of measurement shall be the number of AC units serviced.

The tendered rate shall include full compensation for the servicing of the units as per Manufacturer's instruction of filters, cleaning of the housing, checking of all switches, thermostat and compressors as described in clause PFD 04.02.01.

Item			Unit
PFD	05.01.02	**Replace AC temp controller**	No

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

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

Item			Unit
PFD	05.01.03	**Vacuum, re-gas and re-lubricate AC unit**	No

The unit of measurement shall be the number of AC units vacuumed, re-gassed and re-lubricated.

The tendered rate shall include full compensation for the evacuation of the unit, the re-filling of the gas and the lubrication of all fan bearings.

Item			Unit
PFD	05.01.04	**Supply and Install A/C unit**	No

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

The tendered rate shall include full compensation for the removal of the defective unit, the supply, installation, testing and commissioning of the new unit including all piping and electrical connection.

Item			Unit
PFD	05.01.05	**Replace isolation**	m

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

The tendered rate shall include full compensation for the removal of the existing isolation: supply, handling and installation of the specified type of isolation.

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
PFD	05.01.06	**Replace Control (PC) Board**	No

The unit of measurement shall be the number of defective PC Boards diagnosed and replaced.

The tendered rate shall include full compensation for the removal of the defective boards: supply, handling and installation of the specified new PC board.

PFD 06 DETAILS OF MAINTENANCE WORK

PFD 06.01 GENERAL

The Contractor shall be responsible for the complete maintenance of all the equipment, components, installations and systems forming part of this repair and maintenance contract for Installation A9, B9, C9, D9 & E9. The Contractor shall strictly adhere to Additional Specification SA: General Maintenance, and Technical Specification FD: HVAC with regards to the maintenance period, obligations, responsibilities, actions and activities, etc, which shall also include the following maintenance actions:

(a) Routine preventative maintenance. A guideline to the required actions is provided in specification FD. The actions will not be limited to these guidelines, but shall include all additional actions, work, materials, etc, necessary to maintain this installation at an acceptable level.

(b) Corrective maintenance as described and defined in Additional Specification SA: General Maintenance.

(c) Breakdown maintenance as described and defined in Additional Specification SA: General Maintenance.

(d) For this particular installation a emergency breakdown shall be defined as a breakdown, resulting in non-operation of HVAC equipment.

Emergency breakdown shall be defined as failure to any equipment, resulting in the room conditions exceeding the temperature norms as defined by the Occupational Health and Safety Act as amended.

TECHNICAL SPECIFICATION

FN WATER PUMP SYSTEMS

CONTENTS

FN 01 SCOPE

This specification covers the decommissioning, removal, service and reconditioning, installation, testing, commissioning and maintenance of pumping equipment, motor control devices and low-voltage cables.

FN 02 STANDARD SPECIFICATIONS

FN 02.01 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:

BS 5316, Part 1	-	Acceptance tests for centrifugal, mixed flow and axial pumps
SANS 948	-	Three-phase induction motors
SANS 1222	-	Enclosures for electrical equipment classified by IP code
BS 4999	-	General requirements for rotating electrical machines
BS 1486, Part 2	-	Heavy duty lubrication nipples
ISO 281/1	-	Rolling bearings – dynamic load ratings and rating life

FN 03 PUMP DESIGN AND REQUIREMENTS

(a) The pump shaft shall be manufactured from stainless steel and shall be sealed where it enters the casing with double mechanical face seals.

(b) The impeller shall be suitable for pumping the type of clear water as specified.

(c) The impeller shall be manufactured from stainless steel or, in the case of other materials, it shall be coated with an approved material resistant to abrasion and corrosion prevalent to the conditions under which the impeller shall operate. For pumps rated below 2 kW non-metallic impellers may be utilised.

(d) The impeller shall be statically, dynamically and hydraulically balanced. No holes may be drilled in the impeller to balance it with regard to mass distribution.

(e) Only permanently sealed ball or roller bearings shall be installed.

(f) Bearings shall have a B-10 life rating of 100 000 hours.

(g) The pump shall be a currently catalogued product.

(h) Performance curves shall be based on a reproducible and certified test carried out in an approved testing facility, such as the SANS.

(i) The flow rate at break-off point of the curve for the impeller selected shall be at least 1,5 times that of the maximum flow rate specified.

(j) The head at zero delivery of the curve of the impeller selected shall be at least 1,2 times the maximum head in the pump's operational range.

(k) Each pump shall be clearly labelled. The label shall be a 0,5 mm thick stainless steel plate of dimensions 100 mm x 50 mm. The label shall be fixed to the pump exterior with an approved adhesive or other method after the completion of corrosion protection on the pump. It may be bent to follow the shape of the pump exterior but shall not be bent to accommodate sharp folds. Under no circumstances shall the stainless steel plate of the label influence, damage or otherwise have a detrimental effect on the corrosion protection system. The label shall include the following information:

- pump rates
- pump head
- power required
- NPSH (r) rotational speed
- impeller detail.

(l) Centrifugal pumps shall comply with relevant and applicable items under the clause on technical requirements regarding all pump types, as well as the following:

(i) Preference shall be given to pumps of the self-regulating type and where the power consumption characteristic is such that the power consumption decreases with an increase in delivery to beyond a certain limit, thus ensuring that the motor is not overloaded in the event of a large reduction in pumping head.

(ii) The casing for centrifugal pumps shall be horizontally or vertically split to allow removal of parts.

(iii) The efficiency of the pump shall not be less than 95 % of its maximum efficiency at the selected operating point, where the latter shall not be less than 80 %.

FN 04 MOTOR DESIGN AND REQUIREMENTS

(a) Electric motors shall comply with the requirements of SANS 948

(b) All motors shall, where possible, be from the same manufacturer and shall have the same interchangeable frames. Variations in type and size shall, where possible, be limited to make stocking a variety of special spares unnecessary.

(c) All motors shall have dynamically balanced rotors supported by maintenance-free, sealed-for-life ball bearings.

(d) All motors shall be suitably coated to ensure the satisfactory operation of the motor under the specified class of service.

(e) All terminal boxes shall be waterproof and suited for submersion up to the depth as specified for the pumps.

(f) An adequate length of waterproof cable, purpose-made for submerging, shall be supplied with each submersible motor. The coupling of this cable to the normal

power-distribution cable, which usually is of the PVC type with steel-wire armour, shall be placed at least 1,0 m above the maximum water level by means of a purpose-made, weatherproof, outdoor junction box. The submerged cable shall be supported to minimise any movement of the cable, which result from turbulence caused by the operation of the equipment or the flow of the water.

(g) Thermistor protection or Klixon type temperature switches shall be provided for submersible motors.

FN 05 WORKING VOLTAGE AND SUPPLY SYSTEMS

The motors shall be capable of operating within ± 10 % of the nominal supply voltage without risk of damage. All motors shall be suitable for operating continuously at the specified three-phase voltage system under actual service conditions, including the ± 10 % voltage tolerance, without exceeding the specified temperature rise determined by the resistance on a basic full load heat run.

All motors shall be capable of operating continuously under actual service conditions at any supply frequency between 48 and 51 Hz together with any voltage between ± 5 % of the nominal supply voltage.

The slip-in speed of any motor at 80 % of the nominal voltage at 50 Hz shall not exceed a percentage agreed on by the Engineer, and the motors shall be capable of operating at this voltage for a period of five minutes without deleterious heating.

FN 06 PROTECTION AND CONTROL DEVICES

Submersible pumping equipment shall have float switches to switch the pump motor on and off, according to the level of the liquid. Switches shall operate freely and not be hindered by cables or other switches and shall switch off at a level where no damage to the pump or motor will occur.

Three level switches shall operate a pump control system:

(a) Level switch one shall switch off pumps at low level;

(b) Level switch two shall switch on one pump at an intermediate level, to draw the liquid down to level 1. When the level again rises to where level switch two was switched on, the pump duty shall rotate and start the motor parallel to the one which ran the first time;

(c) Level switch three shall switch on both pumps to run in parallel at a high level.

In the event of a pump failing to start, the other pump must automatically be restarted.

Pumps shall be operated in both manual and automatic modes.

FN 07 DETAIL OF WORK

FN 07.01 SERVICE MOTOR CONTROL CENTRE

(a) The inside and outside of all surfaces of the motor control centre must be thoroughly cleaned and metal surfaces treated for rust and corrosion and repainted to specification.

(b) Float switches for level sensing shall be checked. Missing, damaged or faulty switches shall be replaced with new switches of similar and equal type. The switches must be installed and supported on suitable brackets to prevent the cables and switches from tangling, due to the inflow of the sewage water.

(c) Check and tighten all terminations of all equipment.

(d) Clean out all switchgear and equipment properly to remove dust and spider webs.

(e) Dismantle and clean all moving parts and contacts of magnetic contactors and starters, reassemble, check overload trip units and adjust correctly. Test for correct functioning on completion of repair work.

(f) Replace any damaged ammeters, switches and lamps on the control with parts similar and equal to the existing types on the panel.

FN 08 MEASUREMENT AND PAYMENT

FN.01 **DECOMMISSIONING AND REMOVAL OF PUMPING EQUIPMENT**..... Unit: number

The unit of measurement shall be the number of pumping equipment units decommissioned and removed.

The tendered rates shall include full compensation for all labour, machinery, tools, transport and site handling necessary for the decommissioning and removal of pumping equipment.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

FN.02 **SERVICING OF PUMPING EQUIPMENT**..... Unit: number

The unit of measurement shall be the number of pumps and motors serviced as per manufacturers specifications.

The tendered rates shall include full compensation for servicing of components and materials, and for tools, transport, site handling and labour necessary for the complete servicing of pumping equipment.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

FN.03 **INSTALLATION, TESTING AND COMMISSIONING OF PUMPING EQUIPMENT**..... Unit: number

The unit of measurement shall be the number of pumping equipment units tested and commissioned.

The tendered rates shall include full compensation for the site handling and positioning of the pumping equipment, including the fastening of the equipment in its designated position. The following shall also be included in the tendered rates:

(a) Installation of the guide rails and sealing frame;
(b) Coupling of all required pipes flanges, including all required gaskets, nuts, bolts and washers;

(c) Routing and fastening of the power cable up to the isolator box;
(d) All required installation materials, labour and consumables to render a complete and working installation.

The tendered rates shall also include full compensation for all preliminary tests, delivery and efficiency tests if required and commissioning tests. Commissioning tests shall comply with the section dealing with testing and commissioning.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

FN.04 **SERVICING OF MCC BOARDS OR OTHER ELECTRICITY BOARDS**..... Unit: number

The unit of measurement shall be the number of MCC boards or other electricity boards serviced.

The tendered rates shall include full compensation for replacement of components and materials and for tools, transport, site handling and labour necessary for the complete servicing of all components of the board.

TECHNICAL SPECIFICATION HA

MEDIUM AND LOW VOLTAGE EQUIPMENT

CONTENTS

HA 01 SCOPE

HA 01.01 This specification covers the repair and maintenance of medium and low voltage distribution equipment. The equipment comprises of MV/LV distribution substations and miniature substations.

HA 01.02 This specification forms an integral part of the repair and maintenance contract document and shall be read in conjunction with Portion 3, the Additional Specification included with this document.

HA 02 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

HA 02.01 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.

HA 02.02 SANS Specifications

a) SANS 10400
b) SANS 10142-1
c) Refer to the repair and maintenance procedures for the specific standards applicable to each procedure.

HA 02.03 Department of Public Works Specifications

a) PW 774

HA 02.04 Occupational Health and Safety Act of 1993

HA 02.05 Manufacturer's specifications and installation instructions

HA 02.06 Additional requirements

a) Equipment and material installed shall be new and unused.
b) The Contractor shall ensure that all safety regulations and measures are applied and enforced during repair and maintenance work on medium and low voltage equipment.

HA 02.07 Additional standards, specifications, regulations and codes listed with the maintenance and repair procedures specified elsewhere in this document.

HA 02.08 The Contractor shall familiarise himself with site and equipment conditions to ensure that all work can be performed in a safe manner.

HA 03 OPERATING AND MAINTENANCE MANUALS

HA 03.01 PROCUREMENT OF AVAILABLE AS-BUILT INFORMATION

a) At the commencement of the contract, the Contractor shall obtain all available as-built documentation from the Engineer and from the various parties previously responsible for operations and maintenance tasks. These parties shall include employees of the Client, or external contracted personnel.
b) If this information is available the contractor shall attempt to obtain the internal wiring diagrams and associated operations and maintenance information from the manufacturers of all switchgear panels.
c) The contractor shall verify the correctness of all the abovementioned as-built information by surveying the installations. The surveying of the installation shall include the following :
    i) The tracing (by sight only) of all equipment indicated on as-built information, excluding the instrumentation and/or control wiring of distribution equipment.
    ii) The marking up of the as-built information to indicate the correctness or not of the as-built information. Equipment indicated on the drawings that are not installed on-site shall be indicated as non-existing, and equipment that exists on site but are not indicated on the as-built information shall be indicated as existing.
d) The contractor shall compile a complete single line or schematic diagram representation of the complete installations. This single line diagram shall indicate the distribution substations and miniature substations. The inter-connections between all the components of the distribution substation shall be shown, and the various components shall be labelled using names designated by the contractor.
e) All information that was verified and or compiled from existing sources as well as information that was compiled independently by the contractor shall be recorded in electronic format.
f) The contractor shall supply the Engineer with three sets of all the abovementioned information in electronic format, and three sets in hardcopy format. This information shall be compiled and completed during the repair phase of the contract, and shall be submitted not later than the end of the repair phase.

HA 03.02 Over and above what is specified in the Additional Specification – SB Operating and Maintenance manuals, the Operating and Maintenance Manual to be compiled shall include the following maintenance data:

a) A maintenance record of all materials and equipment replaced or worked on as part of this contract.

b) Summary maintenance data recording the frequency of replacement of consumables and replacement material such as luminaires.

HA 04 TEST AND INSPECTION FOLLOWING COMPLETION OF REPAIR WORK

HA 04.01 Refer to the test and inspection requirements specified with each procedure.

HA 04.02 The Contractor shall perform the following tests on completion of any work on medium voltage cables or cable terminations:

a) Voltage tests

Each section of the cable installation between miniature substations shall be subjected to a preliminary voltage or insulation resistance test to prove the insulation resistance.

b) Continuity test

The resistance between each core and the lead sheath of the cable shall be measured for each section while the core and sheath is short circuited at the far end to ascertain if all connections have been correctly made.

All test instruments shall be of a high quality and shall, if required, be calibrated by the SANS or such body approved by the Engineer at the cost of the Contractor.

c) DC medium-voltage tests

Each cable circuit, including joints and terminations, shall be tested by means of a direct current voltage of 18kV between the different cores and between the cores and the lead sheath or copper tape screen for a period of 15 minutes. The voltage shall be gradually raised to 18kV and kept there for 15 minutes.

HA 04.03 The Contractor shall undertake all repairs and replacements at his own cost in the event of the installation failing the above-mentioned tests. The tests shall be conducted in the presence of the Engineer before the Engineer shall agree to accept any part of the installation. The Contractor shall furthermore undertake any other tests the Engineer may prescribe to satisfy himself that the work is of an acceptable standard.

HA 04.04 The Contractor shall upon request provide the Engineer with test and calibrating certificates to prove that the measuring and testing instruments have been tested and calibrated by an organisation that is acceptable to the Engineer.

HA 05 MAINTENANCE TOOLS AND SPARES

HA 05.01 On commencement of the Repair and Maintenance Contract, the Contractor shall compile an inventory of the existing Tools and Spares in the presence of the Client.

HA 05.02 The Contractor shall supply all tools and spares required to perform the specified maintenance tasks, and he/she shall ensure that adequate tools and spares are available at all times to enable efficient repair and maintenance.

HA 06 QUALITY ASSURANCE SYSTEM

HA 06.01 Following formal approval of his Quality Assurance system by the Engineer, the Contractor shall implement the approved QA system.

HA 06.02 Records of this QA system shall be kept throughout the duration of the contract and shall be submitted to the Engineer as required.

HA 07 RE-COMMISSIONING OF INSTALLATION

HA 07.01 On completion of the initial repair work the installation shall be commissioned by the Contractor.

HA 08 MEASUREMENT AND PAYMENT

HA 08.01 The following payment specifications apply to all the repair and maintenance procedures specified in this contract:

For each of the repair and maintenance procedures, the tendered rate shall include full compensation for the following:

a) All labour required to complete the procedure.
b) The supply, delivery, installation, testing and commissioning of all equipment and material required to complete the procedure. (Except where exclusions to this clause is specified in the remaining specifications that forms part of the specific procedure).
c) The prior arrangement by the contractor to obtain timely access to facilities and the shutting down of equipment by the responsible persons as may be required to complete the procedure.
d) All costs associated with the transportation to and no site, the operation of, and the insurance and safekeeping by the contractor of all specialised and other plant and equipment that may be required for the completion of the procedure.
e) The execution of all site and other tests that may be required from the contractor to prove compliance with the specified standard specifications, regulations and codes. These tests shall be specified elsewhere as part of the procedure, or can be requested by the Engineer, or national and other laws, bylaws and regulations may require such tests.
f) The supply of indisputable proof in documented format that all the equipment and material supplied and installed in terms of the procedure complies with the specified standard specifications, regulations and codes.

HA 09 REPAIR WORK TO MEDIUM AND LOW VOLTAGE EQUIPMENT

HA 09.01 All components of the medium and low voltage network shall be repaired during the first phase of the repair and maintenance contract, except in cases where the repair actions are specified to require specific approval for execution.

HA 09.02 The scope of the repair work shall include, but not be limited to the activities listed below.

HA 09.03 The Contractor shall record the repair actions in tabular format before the maintenance phase commences.

HA 09.04 Repair work shall be executed within the approved period for repairs. This period shall be agreed at the start of the contract period.

HA 09.05 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 Department of Public Works.

HA 09.06 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.

HA 09.07 The repair actions are specified in the form of work procedures. These procedures comprise of step-by-step instructions on how to perform each repair action.

HA 10 MAINTENANCE OF MEDIUM AND LOW VOLTAGE EQUIPMENT

HA 10.01 The electrical distribution network shall be maintained in accordance with Additional Specification SA – General Maintenance.

HA 10.02 The following maintenance actions will be required under this phase of the contract:

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

HA 10.03 The maintenance schedules and frequency of maintenance activities shall be developed under the maintenance control plan which will be instituted by the Contractor. The Contractors responsibility in this regard is specified in the Additional Specification SA – General Maintenance.

HA 11 DISTRIBUTION NETWORK: TECHNICAL DESCRIPTION

HA 11.01 This section describes the electrical distribution network that will be repaired and maintained in terms of this contract.

HA 12 TECHNICAL DETAILS: INITIAL REPAIR PROCEDURES

HA 12.01 This section contains the specifications for the initial repair procedures that will be completed as part of the contract. The contractor should note that the tendered rate for each procedure shall include both the supply, delivery, installation, testing and commissioning of equipment and material, and the labour and other costs associated with the completion of the procedure.

HA 12.02 Scope of repair and maintenance work

The repair and maintenance procedures are the following:

RP01 Substation buildings cleanup
RP02 Installation of hasp-and-latch door lock mechanism
RP03 Replacement of glass windowpanes
RP04 Installation of window-louvres
RP05 Installation of ventilation-louvres
RP06 Installation of padlocks

RP07 Installation of steel cable trench cover plates
RP08 Installation of wooden cable trench cover planks
RP09 Equipment oil cleanup
RP10 Replacement of lighting equipment
RP11 Replacement of photocell and reinstallation of outdoor light fitting
RP12 Replacement of socket outlet cover plate
RP13 Cleanup of tar/bitumen spills
RP14 Replacement of MV switchgear fuses
RP15 Ring-main unit overhaul
RP16 Replace ring-main unit contacts and contact blades
RP17 Insulation oil sampling and analysis
RP18 On-site insulation oil reconditioning
RP19 Supply and installation of insulation oil
RP20 MV circuit breaker oil service
RP21 Replacement of a cover plate for medium voltage switchgear panel
RP22 Installation of a transformer earth conductor
RP23 Replacement of transformer oil gaskets
RP24 Reparation of transformer bushing insulation
RP25 Replacement of transformer dehydrating breather
RP26 Sealing of a low voltage cable trench and sleeve section
RP27 General repairs to low voltage wiring in distribution panels
RP28 Replacement of ammeters
RP29 Replacement of voltmeters
RP30 Replacement of instrumentation fuses
RP31 Secure LV panels to floor
RP32 Installation of LV cable clamps
RP33 Reinstallation of LV distribution board front panel
RP34 Replacement of DB board front cover panel
RP35 Replacement of LV circuit breaker
RP36 Reparation of insulation on low voltage busbar
RP37 Reparations and LV cable replacements at a miniature substation
RP38 Replacement and or reparation of MV cable terminations
RP39 Replacement of MV cable sections and the terminating of the cable
RP40 Reinstallation of a LV cable in a distribution kiosk

HA 12.03 The repair and maintenance tasks are specified in the following procedures :

1. Substation building cleanup

1.1 Procedure Number RP01

1.2 Scope

This procedure covers the internal cleanup of a substation building.

1.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

1.4 Task Description

All tasks described in this procedure shall be carried out in all three rooms of the substation building (MV switchgear room, transformer room, LV room). Generator rooms are excluded from this task.

a) The contractor shall remove all loose refuse and other scrap materials and objects from the substation and dispose thereof off site at a suitable location (excluding any equipment, material or other objects which could be considered to be of value to the client).

b) The contractor shall clean the substation floors and remove all sand, dust and other loose particles.

c) The contractor shall wash all walls using a suitable cleaning agent (water alone shall not be acceptable) and sponges, cloths and other cleaning materials as may be required. All smudge markings and other removable dirt marks shall be removed from the walls as part of this task.

1.5 Measurement and Payment

a) The unit of measurement shall be the number of substations cleaned. All three rooms of a substation building shall be considered as one unit.

b) The tendered rate shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for the supply of all cleaning materials that may be required in the execution of this task.

2. Installation of hasp-and-latch door lock mechanism

2.1 Procedure Number RP02

2.2 Scope

This procedure covers the installation of steel clamping plates and a hasp-and-latch door lock mechanism, and the reinstallation of the existing door handles.

2.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

2.4 Task Description

a) The contractor shall remove the existing door handle and locking latch mechanism from both of the double external doors of the substation.

b) The contractor shall supply and install two sets of clamping plates, one set on each of the two doors. Each set of clamping plates shall consist of two galvanised steel plates of minimum dimensions 2.5mm thickness x 200mm x 300mm. The clamping plates shall be installed in adjacent positions on the two adjacent double doors, and in a position such that it covers the area where the existing door handles are installed. Each set of clamping plates shall be installed at neatly aligned opposing sides of the door. The plates shall be secured with at least four bolts, washers and nuts, with a minimum bolt diameter of 8mm. The bolts shall be of the rounded head type and shall be installed with the rounded heads facing outdoors and the washer and nut ends facing indoors. The plates shall be aligned such that the edges of the plates do not protrude beyond the edges of the door, thereby preventing injury to persons opening and closing the doors.

c) The contractor shall supply and install a hasp-and-latch combination onto the lower part of the clamping plates of the two doors. The hasp-and-latch unit shall be made of either stainless steel, galvanised steel, or chrome covered metal. The hasp-and-latch unit shall be of the type that closes onto itself, thereby completely covering all securing bolts and screws when in the

closing position. The size of the hasp-and-latch unit shall be such that it is suitable for locking with no smaller than a 75mm shackle type Viro lock.

d) The contractor shall reinstall all the original door handles onto the upper part of the clamping plates of both doors. The contractor shall supply and install suitable fastening bolts and screws for this purpose.

2.5 Measurement and Payment

a) The unit of measurement and payment shall be a lump sum.

b) The lump sum shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for the supply, delivery and installation of all material and equipment that is required for the completion of this task.

3. Replacement of Glass Windowpanes

3.1 Procedure Number RP03

3.2 Scope

This procedure covers the replacement of windowpanes in substation buildings.

3.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

3.4 Task Description

a) The contractor shall remove all broken glass particles and fixing putty from the frame where a windowpane has been broken.

b) The contractor shall install a new windowpane by installing the glass and the fixing putty. The fixing putty shall be worked off to a smooth and sloped finish.

c) The contractor shall measure the windowpane to determine the exact dimensions required.

d) The glass supplied shall have a minimum thickness of 5mm.

3.5 Measurement and Payment

a) The unit of measurement shall be number of windowpanes installed. The schedule of quantities shall specify the type of equipment in terms of the dimensions of the windowpane. The different types are the following:

i) 1.0m wide x 1.5m high

ii) 1.5m wide x 2.5m high

ii) 0.2 m wide x 0.3m high

b) The tendered rate shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for the measurement on site of the dimensions of the windowpanes prior to the ordering of any material.

4. Installation of Window-louvres

4.1 Procedure Number RP04

4.2 Scope

This procedure covers the supply, delivery and installation of steel window-louvres to cover the outdoor side of substation building windowpanes. The reason for the installation is to protect the windowpanes from vandalism.

4.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

4.4 Task Description

a) The contractor shall permanently install frame mounted louvres on the outside of the substation windows. The frames shall be attached to the walls by means of anchor bolts.

b) Each unit shall consist of a standard manufactured louvres arrangement and it (including the frame and fixing brackets) shall be manufactured from sheet metal painted with an anti-corrosive paint.

c) The contractor shall measure the dimensions of each window frame, and the frame shall be manufactured according to these measurements to completely cover the exposed windowpane.

d) The windowpane areas that shall be used to base the tender rates on shall be 1.0m wide by 1.5m high, and 1.5m wide by 2.5m high.

4.5 Measurement and Payment

a) The unit of measurement shall be the number of louvres installed. The schedule of quantities shall specify the type of equipment in terms of the dimensions of the windowpane. The different types are the following:

i) 1.0m wide x 1.5m high

ii) 1.5 m wide x 2.5m high

5. Installation of Ventilation-louvres

5.1 Procedure Number RP05

5.2 Scope

This procedure covers the supply, delivery and installation of an inlet and outlet pair of wall mounted ventilation-louvres in the transformer room of a substation building. The installation shall include the breaking of a hole in the wall and the installation and cementing up of the installed louvres.

5.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with original equipment manufacturer's specifications, and operation and maintenance instructions.

5.4 Task Description

a) The contractor shall install an inlet and outlet pair of sheet metal or aluminium ventilation louvres in the walls of the transformer room. The contractor shall break a suitably sized opening in the wall using suitable equipment, and the louvres shall be permanently installed inside the wall. The louvres shall not be surface mounted. The contractor shall finish off the sides of the opening with an approved building plaster after completion of the installation.

b) The plaster work around the louvres shall be finished off to a smooth appearance, and shall be repainted with a similar paint to that on the existing wall sections.

c) The louvres installed shall be a Trox Model WKL Weather Louver or equivalent model. The louvres shall be medium sized and of the vermin proof type. The outlet louvre shall be a third size larger than the inlet louvre to enable efficient free air circulation.

d) The two louvres shall be installed in two walls opposite from each other. The outlet louvre shall be installed high in the wall and the inlet louver shall be installed at a suitably lower height to enable efficient free air circulation.

5.5 Measurement and Payment

a) The unit of measurement and payment shall be the number of ventilation-louvre pairs installed. (One unit rate shall apply to the combination of an inlet/outlet pair of louvres).

6. Installation of Padlocks

6.1 Procedure Number RP06

6.2 Scope

This procedure covers the supply, delivery and installation of padlocks to secure substation doors and metal enclosure doors such as those of miniature substations and low voltage distribution kiosks.

6.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

6.4 Task Description

a) The contractor shall remove the existing padlocks from the specified substation doors, or metal enclosure doors such as those of miniature substations and low voltage distribution kiosks. This shall be done using a suitable sized bolt cutter or other equipment. Care shall be taken not to damage the door handle. Latch or other locking mechanism during the removal of the old locks.

b) The contractor shall install the new padlocks and close the lock on installation.

c) All padlocks supplied shall be of the 75mm shackle Viro type.

d) All padlocks supplied shall be of a single batch and shall be operated using a single master key.

e) The contractor shall retain a set of keys, and supply the Engineer with a set consisting of twenty spare keys.

6.5 Measurement and Payment

a) The unit of measurement shall be the number of padlocks supplied.

b) The tendered rate shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for the installation of the locks on the various substation and enclosure doors throughout the installations, and the removal of old locks in accordance with this procedure.

7. Installation of Steel Cable Trench Cover Plates

7.1 Procedure Number RP07

7.2 Scope

This procedure covers the supply, delivery and installation of steel cable-trench cover plates at sections of cable trenches in substation buildings where existing cable-trench cover plates have been removed.

7.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

7.4 Task Description

a) 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.

b) The cover plates shall be manufactured from mild steel chequered plate with a base thickness of 4.5mm and a chequered stud thickness of 6.1mm. Each cover plate shall have two guiding lengths of angle iron welded to the bottom of the plate. The guiding angle irons shall be 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 40mm x 3mm.

c) Each cover plate shall be fitted with two mild 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.

d) All metal edges shall be chamfered to remove all burrs so that the cover plates can be handled without injury.

e) 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.

7.5 Measurement and Payment

a) The unit of measurement shall be the number of cable trench cover plates supplied, delivered and installed. The schedule of quantities shall specify the type of cover plate in terms of its dimensions. The following types shall be supplied:

i) 0.6m wide x 0.5m long

ii) 0.6m wide x 0.6m long

iii) 0.6m wide x 0.8m long

iv) 0.6m wide x 1.5m long

v) 0.6m wide x 1.8m long

vi) 0.7m wide x 0.3m long

vii) 0.7m wide x 1.5m long

8. Installation of Wooden Cable Trench Planks

8.1 Procedure Number RP08

8.2 Scope

This procedure covers the supply, delivery and installation of wooden cable-trench cover planks at sections of cable trenches in substation buildings where existing cable-trench cover plates have been removed.

8.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

8.4 Task Description

a) The contractor shall manufacture and install sections of wooden plank trench cover plates to fit the sections in substations where old cover planks have been removed. The contractor shall measure up the cable trenches and manufacture the planks 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.

b) The planks shall be cut so that the length of the planks is equal to (or slightly less than) the width of the cable trenches inlet grooves. The planks shall be arranged at right angles to the length of the trench, with a number of parallel planks making up the cable trench covering.

c) Each plank shall be fitted with two finger-lifting holes of 20mm diameter at opposing ends of the plank.

d) The planks shall be made from newly cut Sapele wood with minimum thickness and width 38mm and 150mm respectively.

e) All planks shall be treated with an oil-based weather proofing substance.

f) Only one plank in any cable trench section may be narrower than the specified width, and this width shall be such that the trench cover section is properly and completely covered.

8.5 Measurement and Payment

a) The unit of measurement shall be the number of cable trench sections covered. (The number of planks shall not be used as

measurement). The schedule of quantities shall specify the dimensions of the cable trench sections. The dimensions of the cable sections are the following:

i) 0.3m wide x 0.6m long

ii) 0.3m wide x 1.5m long

9. Equipment Oil Cleanup

9.1 Procedure Number RP09

9.2 Scope

This procedure covers the cleanup of oil on an indoor T3 or ring-main unit switchgear bank or on a transformer.

9.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

9.4 Task Description

a) The contractor shall use a suitable solvent to remove the surface oil from the transformer or the three or four panels of the indoor ring-main unit or T3 switchgear bank.

9.5 Measurement and Payment

a) The unit of measurement shall be the number of switchgear banks or transformers cleaned. The schedule of quantities shall specify the type of equipment components in terms of the type and size of the components. The different types are the following:

i) Transformer cleanup

ii) Switchgear bank cleanup

10. Replacement of Lighting Equipment

10.1 Procedure Number RP10

10.2 Scope

This procedure covers the supply, delivery and installation of lighting equipment at various places.

10.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) SANS 10114

c) SANS 163

d) SANS 1012

e) SANS 1084

f) SANS 1250

g) SANS 1279

h) SANS 1777

10.4 Task Description

a) The contractor shall remove the defective luminaires and or other equipment from their fittings.

b) The contractor shall in install and reconnect the circuits to the newly installed lighting equipment.

c) In cases where wiring defects are encountered, the contractor shall supply and install the required wiring and associated material to correct the defects.

d) In cases where a complete light fitting (bayonet type or fluorescent tube luminaire) is installed, the contractor shall also be responsible for reconnecting the new light fitting with the existing light switch. The contractor shall be responsible to ensure that the newly installed light can be switched on and off using the existing light switch, and in cases where the existing light switch is defective or not in place, the contractor shall supply and install the necessary light switch, wiring and other fixing equipment and materials as part of the light fitting.

10.5 Measurement and Payment

a) The unit of measurement shall be number of lighting equipment components supplied and installed. The schedule of quantities shall specify the type of equipment components in terms of the type and size of the components. The different types are the following:

i) Complete Light Fitting - Bayonet Luminaire Type

This component consists of a complete bayonet type luminaire unit. It includes a base unit for installation against a bulkhead or ceiling, a bayonet type globe, and a round globe of the type that screws into the base unit.

ii) Complete Light Fitting - Fluorescent tube Type

This component consists of a complete double tube fluorescent luminaire unit. It includes a base unit for installation against a bulkhead or ceiling (including a translucent cover unit to cover the luminaire tubes), two fluorescent tube luminaires (length 1.8m), and all the associated components such as starters and ballasts that form part of the luminaire unit.

iii) Fluorescent tube luminaire : Length 1.2m

iv) Fluorescent tube luminaire : Length 1.8m

v) Fluorescent tube luminaire : Length 2.4m

vi) Conventional size globe : 100W bayonet fitting

vii) Conventional size globe : 100W screw in fitting

viii) Fluorescent light starter : Length 1.2m

ix) Fluorescent light starter : Length 1.8m

x) Fluorescent light starter : Length 2.4m

xi) Fluorescent light ballast : Length 1.2m

xii) Fluorescent light ballast : Length 1.8m

xiii) Fluorescent light ballast : Length 2.4m

11. Replacement of photocell and reinstallation of outdoor light fitting

11.1 Procedure Number RP11

11.2 Scope

This procedure covers the replacement of a defective photocell, the reinstallation of an outdoor light fitting, and the reconnection of the light fitting and photocell to the internal distribution board of the substation building.

11.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

11.4 Task Description

a) The contractor shall replace the defective photocell with a new and unused photocell. The contractor shall install the new photocell in a position that will ensure that the photocell is exposed to natural light in such a way that will correctly operate when exposed to outdoor light.

b) The contractor shall reinstall the existing outdoor light fitting by means of the appropriate anchor bolts and/or other securing mechanisms.

b) The contractor shall reconnect the photocell and outdoor light to the substation's internal distribution board and light switch. The contractor shall use (supply and install) a 20m length of surfix or equivalent type conductor (4mm^2 copper conductor) between the outdoor light and the internal substation distribution board and light switch. The contractor shall ensure that the surfix conductor is secured against the wall in a manner that complies with wiring regulations.

c) The photocell shall comply with the following specifications :

i) The photocell shall be fitted with switch contacts able to carry no less than 5A.

ii) The photocell current shall not exceed 50mA during no-load conditions.

iii) The photocell shall be suited to 240V ± 6%, 50Hz single-phase alternating current.

iv) The units shall be weather proof and vibration-resistant.

v) The units shall be designed to withstand damage by either stone-throwers or hail. If the units do not possess this quality, separate wire screens shall be provided for this purpose.

vi) The units shall be supplied with a standard NEMA plug and socket. The socket shall have an arm for mounting on a pole.

viii) All parts shall be treated to be corrosion-proof.

ix) The units shall be capable of operating in dusty conditions between - 5°C and + 55°C.

x) The units shall switch on when the light intensity drops to 15 lux ± 20% and switch off when the light intensity reaches 40 lux ± 20%.

xi) When the unit is in the on position, there shall be a time delay of approximately one minute before it switches off due to a sudden increase in the light intensity.

xii) The design of the switch shall ensure a positive on and off switching at all times.

11.5 Measurement and Payment

a) The unit of measurement shall be the number of photocell and outdoor light units replaced and reconnected. One unit shall be considered a single combined photocell and outdoor light combination.

b) The tendered rate shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for the 20m length of surfix or equivalent conductor as specified in this procedure.

12. Replacement of socket outlet cover plate

12.1 Procedure Number RP12

12.2 Scope

This procedure covers the supply and installation of a conventional socket outlet cover plate.

12.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes :

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) SANS code covering socket outlet cover plates.

12.4 Task Description

a) The contractor shall supply and install a conventional socket outlet cover plate in the position where an existing cover plate is missing.

b) The cover plate shall be a new and unused unit made of steel in compliance with the appropriate SANS code.

12.5 Measurement and Payment

a) The unit of measurement shall be the number of socket outlet cover plates supplied and installed.

13. Cleanup of Tar/Bitumen Spills

13.1 Procedure Number RP13

13.2 Scope

This procedure covers the cleanup of tar/bitumen spills caused by leaking cable termination drums of indoor switchgear units.

13.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

13.4 Task Description

a) The contractor shall cleanup the spill caused by the leakage of a tar/bitumen insulating cable termination box. The cable termination box as well as the floor underneath the cable termination box shall be cleaned.

b) A suitable solvent shall be used and all traces of the tar/bitumen shall be removed.

13.5 Measurement and Payment

a) The unit of measurement shall be the number of tar/bitumen spills cleaned.

14. Replacement of Switchgear Fuses

14.1 Procedure Number RP14

14.2 Scope

This procedure covers the replacement of fuses in ring-main units and T3's in both standalone and miniature substation units.

14.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) BS 2692: Fuses for voltages exceeding 1000 V a.c.

c) BS 2692: Part 1 Current-limiting fuses

d) BS 2692: Part 2 1956 Expulsion fuses

e) BS 2692: Part 3 1990 Guide to the determination of short circuit power factor

14.4 Task Description

a) The contractor shall replace blown fuses with new unused fuses.

b) The fuse replacement procedure shall be done in strict accordance with the manufacturers operating and maintenance instructions.

c) The fuses supplied shall be new 11kV HRC fuses, and if the switchgear enclosure allows this, a spare set of fuses shall mounted inside the equipment enclosure.

d) The fuse rating shall be determined on the basis of the rating of the transformer supplied via the fuse.

14.5 Measurement and Payment

a) The unit of measurement shall be the number of fuses replaced and installed. The same rate shall apply to all types of fuses.

b) The tendered rate shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for the supply and installation of a suitably rated fuse.

15. Ring-Main Unit Overhaul

15.1 Procedure Number RP15

15.2 Scope

This procedure includes all tasks associated with the complete overhaul of all three units of a three-legged ring main unit or T3. This includes opening the oil chambers and servicing the normally immersed components of the equipment, and the replacement of the insulation oil. This procedure applies to both the ring-main units of miniature substations and the standalone ring-main units or T3 units in the distribution substations.

15.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) BS 5730: 1979 Codes of practice for Maintenance of Insulating Oil

c) BS 5263: 1975. Method for sampling liquid dielectrics

d) SANS 555: 1985: Standard Specification for Mineral insulating oil for transformers and switchgear (uninhibited)

15.4 Task Description

a) Replacement of Insulating Oil

i) The contractor shall drain the existing oil from all the oil chambers and remove the oil from site using suitable storage methods.

ii) The contractor shall clean the interior of each oil chamber by means of a chamois leather cloth. All sediments shall be removed from the bottom of the oil chamber.

iii) The oil chamber shall be filled to the recommended level with new insulating oil in compliance with the abovementioned specifications.

iv) Care shall be taken to handle, transport, and store insulation oil in accordance with the abovementioned specifications

b) Overhaul of major ring-main unit parts

The following major overhaul tasks shall be completed in addition to the insulating oil service:

i) The switching equipment shall be cleaned using only materials that comply with BS 5730: 1979, and thereafter the equipment shall be cleaned by means of blowing a dielectric cleaner onto the switching parts.

ii) The equipment shall be thoroughly inspected for signs of defects and or equipment damage. Should any defects be detected, these defects shall be reported to the Engineer in documented format. During the inspection specific attention shall be given to any signs of blade arcing.

iii) All moving parts (that are recommended by the original equipment manufacturer to be lubricated) shall be

lubricated using a lubricant complying with the requirements of the original equipment manufacturer.

15.5 Measurement and Payment

a) The unit of measurement shall be the number of ring-main units overhauled. A single rate shall apply to standalone ring-main units or T3's, and to the ring main units of miniature substations. All three or four switching components of a ring-main unit or T3 shall be considered one item in the schedule of quantities, and the tendered rate shall include the work done on all three or four components.

b) The tendered rate shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for the following:

i) All work associated with the overhaul of each piece of equipment as specified in this procedure, excluding the reconditioning of insulating oil, which shall be considered another payment item.

ii) The supply, delivery and installation of the full volume of new insulating oil required to fill all three or four oil chambers of the switching unit to the recommended level.

16. Replace Ring-Main Unit Contacts and Contact Blades

16.1 Procedure Number RP16

16.2 Scope

This procedure covers the replacement of defective contacts and contact blades on ring-main unit and T3 switchgear units (standalone and miniature substation applications).

16.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

16.4 Task Description

a) The contractor shall replace defective contacts and contact blades if the inspection performed during the overhaul of the ring-main units proves that this replacement is required.

b) The contractor shall remove defective contacts and shall supply and install new contacts and contact blades.

c) The type of contacts and contact blades installed shall be as recommended by the original equipment manufacturer.

16.5 Measurement and Payment

a) The unit of measurement shall be the number of sets of contacts and contact blades installed.

17. Insulation Oil Sampling and Analysis

17.1 Procedure Number RP17

17.2 Scope

The scope of this procedure includes all tasks required to analyse the condition of insulation oil in transformers. The transformers include

both standalone and miniature substation transformers, and they are free breathing, dehydrator breathing, or hermetically sealed in type. These tasks include taking insulating oil samples from each separate oil unit, having tests done on each sample, and reporting the test results to the Engineer. All preparation tasks required for and associated with this work (such as arranging for and doing switching of electrical equipment) will be considered part of this task.

17.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) BS 5730: 1979 Codes of practice for Maintenance of Insulating Oil

c) BS 5263: 1975 Method for sampling liquid dielectrics

d) SANS 555: 1985: Standard Specification for Mineral insulating oil for transformers and switchgear (uninhibited)

17.4 Task Description

a) The contractor shall take oil samples from each unit of oil-immersed equipment that forms part of the facilities.

b) Oil sampling shall be done in strict compliance with the operation and maintenance instructions of the manufacturers of the various units of equipment.

c) Oil samples shall be taken from every single and separate oil unit of every piece of equipment, and each sample shall be separately labelled in order to discriminate between the results of different samples.

d) Taking and handling of oil samples shall be done in strict compliance with the specifications outlined in BS 5263: Method for sampling liquid dielectrics.

e) All oil samples shall be tested at a reputable laboratory (not on the Client's site) in accordance with the test procedures outlined in Appendix A of BS 5730.

f) The following insulating oil characteristics shall be tested for according to the methods outlined in Appendix A of BS 5730:

i) Odour

ii) Appearance

iii) Colour

iv) Electric strength

v) Water content

vi) Acidity (neutralisation value)

vii) Resistivity (at 20°C)

viii) Sediment and/or precipitable sludge

ix) Dissolved gas analysis (DGA)

g) The results of the tests shall be supplied to the Engineer in documented format.

h) The test result report shall contain at least the following information:

i) Unique description of equipment from which of oil sample was taken.

ii) Date of sample,

iii) Name of person taking the sample.

iv) Test results for the sample in terms of each of the specified oil characteristics.

v) Recommendations on whether the oil from which the sample was taken should be replaced or reconditioned or not.

vi) Summary recommendation of the general condition of the oil samples tested.

vii) Name of person who conducted the tests.

viii) Name and contact details of the test laboratory.

ix) Certification by the test laboratory that these specific tests have been conducted in compliance with BS 5730.

i) The contractor shall make arrangements with the Engineer prior to taking samples in order to ensure that access can be gained to all required facilities, and that equipment may be switched off as is required.

j) The contractor shall supply the Engineer with proof of his proficiency and experience in taking and analysing insulating oil samples, and of the reputability of the laboratory that will do the tests.

k) The contractor shall, at his own expense familiarise himself with the type and manufacturer of the various equipment on site, as is required for the proper taking of samples in accordance with the manufacturer's requirements.

17.5 Measurement and Payment

a) The unit of measurement shall be the number of transformers from which samples are taken and analysed. The same rate shall apply to all sizes of transformers.

18. On-site Insulating Oil Reconditioning

18.1 Procedure Number RP18

18.2 Scope

This procedure covers tasks that form part of the on-site reconditioning of insulating oil presently used in all transformer and switchgear equipment. The transformers include both standalone and miniature substation transformers of the free breathing, dehydrator breathing, or hermetically sealed in type. Oil immersed switchgear comprises of ring-main unit and or T3 units. In the case of transformers, the procedure also includes the servicing of the dehydrating breather of the transformer.

This task includes the supply (for the contractor's own use only) of oil reconditioning equipment, and the completion of the oil reconditioning task itself. All preparation tasks required for and associated with this work (such as arranging for and doing switching of electrical equipment) will be considered part of this task.

18.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) BS 5730: 1979 Codes of practice for Maintenance of Insulating Oil

c) BS 5263: 1975. Method for sampling liquid dielectrics

d) SANS 555: 1985: Standard Specification for Mineral insulating oil for transformers and switchgear (uninhibited)

18.4 Task Description

a) The contractors shall recondition the insulating oil of the equipment that has been confirmed in writing by the Engineer to require reconditioning (based on the results of insulation oil tests that will be conducted). The contractor shall supply and install insulation oil and top up the oil chamber of the equipment in cases where the present oil levels are below the maximum recommended oil level. The oil used for this purpose shall be in compliance with the insulation specifications as set out elsewhere in this document.

b) The contractor shall use his own equipment for insulating oil reconditioning.

c) The contractor shall submit details of the oil reconditioning equipment to the Engineer prior to commencing with any oil reconditioning. The contractor shall only be allowed to commence with oil reconditioning work once the Engineer has approved the equipment.

d) The contractor shall recondition the full volume of insulation oil contained in each unit of equipment to the specified requirements.

e) Oil reconditioning of transformers only shall be done on-load and without de-energising the transformer.

f) The contractor shall ensure that the oil reconditioning equipment is properly used to ensure the maximum improvement of the oil characteristics. The contractor shall be required by the Engineer to perform on-site tests in order to demonstrate the condition of the reconditioned oil.

g) The contractor shall ensure that the reconditioned oil conforms to the following minimum specifications:

   i) Electric strength (minimum) 50kV

   ii) Acidity (maximum) 0.1g KOH / mg of oil

   iii) Water content (maximum) 30 p.p.m. (parts per million)

h) The contractor shall familiarise himself with site conditions to ensure that an adequate electrical supply is available where required to operate the oil reconditioning equipment. The contractor shall be allowed to make use of the Client's facilities for this purpose provided that the contractor ensures safe operating practices for its own and the Client's personnel. Where no supply is available from the Client's electrical network, the contractor shall provide all generator equipment (including fuel

and other consumable items) that is required for the oil reconditioning.

i) The contractor shall familiarise himself with site conditions to ensure that adequate space is available where required to temporarily install and operate the oil reconditioning equipment.

i) In the case of a transformer the contractor shall also do a complete service of the transformer's dehydrating breather. This service shall be done in accordance with the following specifications:

i) The contractor shall check the quantity and colour of the dehydrating agent (typically silica gel) and shall reactivate or replace it where necessary.

ii) The silica gel shall be considered to require replacement if its colour is pink or if the breather is not filled to the required level, and it shall be considered not to need replacement if its colour is deep blue and the breather is filled to the required level.

iii) Silica gel used for replacement shall be new silica gel and shall comply with BS 3523.

iv) The oil seal or bath at the base of the dehydrating breather shall be removed, cleaned out, and refilled with new insulation oil. The insulation oil used for this purpose shall be new insulation oil in compliance with SANS 555. The dehydrating breather shall be refilled with insulation oil to the level as prescribed in the manufacturer's maintenance instructions.

18.5 Measurement and Payment

a) The unit of measurement shall be the number of transformers and the number of ring-main units reconditioned. The schedule of quantities shall specify the type of equipment to be oil-reconditioned. A single rate shall apply to all sizes of transformers, and the tendered rates shall be based on an average transformer size of 200kVA. A single rate shall apply to all standalone ring-main units or T3's, and this rate shall include full compensation for the reconditioning of all three or four oil chambers. The different types are the following:

i) Transformer

ii) Ring-main unit or T3

b). The tendered rate shall include full compensation for all aspects specified in clause HA 08. The supply of insulation oil used for topping up purposes shall be provided for elsewhere under a separate payment item. In addition to this, the tendered rate shall also include full compensation for the dehydrating agent, and or dehydrating agent reactivating equipment that may be required during this operation.

19. Supply and Installation of Insulation Oil

19.1 Procedure Number RP19

19.2 Scope

This procedure covers the supply, delivery and installation of insulating oil for use in switchgear insulation chambers or in power transformers.

19.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) BS 5730 Codes of practice for Maintenance of Insulating Oil

c) BS 5263 Method for sampling liquid dielectrics

d) SANS 555 Standard Specification for Mineral insulating oil for transformers and switchgear (uninhibited)

19.4 Task Description

a) The contractor shall supply, deliver and install insulation oil according to SANS 555.

b) The oil shall be installed in transformer and or switchgear equipment in accordance with the applicable procedures elsewhere in this document.

c) The contractor shall ensure that the transportation, handling, and storage of oil is done strictly in accordance with BS 5730.

d) Oil shall only be supplied in terms of this procedure on the instruction of the Engineer. Oil shall further only be supplied if the existing insulating oil in equipment has leaked out or is below the required level. The contractor shall not replace existing insulating oil with new oil unless instructed so in writing by the Engineer.

e) The oil chambers of the equipment being topped up shall be filled to the maximum level recommended by the original equipment manufacturer.

19.5 Measurement and Payment

a) The unit of measurement and payment shall be litres of oil supplied and installed in either transformer or switchgear equipment.

b) The tendered rate shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation all costs associated with the proper transportation, handling, and storage of oil in accordance with this procedure.

20. MV Circuit Breaker Oil Service

20.1 Procedure Number RP20

20.2 Scope

This procedure covers the tasks associated with the oil servicing of medium voltage metal-clad oil insulated switchgear panels. The service includes the draining and cleaning of the oil chambers and the replacement of the insulation oil.

20.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) BS 5730 Codes of practice for Maintenance of Insulating Oil

c) BS 5263 Method for sampling liquid dielectrics

d) SANS 555 Standard Specification for Mineral insulating oil for transformers and switchgear (uninhibited)

20.4 Task Description

This procedure applies to indoor oil insulated medium voltage circuit breakers.

a) The contractor shall drain the existing oil and remove the oil from site using suitable storage methods.

b) The contractors shall clean the interior of the circuit breaker oil chamber by means of a chamois leather cloth. All sediments shall be removed from the bottom of the oil chamber.

c) The circuit breaker inside the oil chamber shall be serviced by means of blowing a dielectric cleaner onto the switching parts.

d) The circuit breaker shall be thoroughly inspected for signs of faults and or equipment damage. Should any faults be detected, these faults shall be reported to the Engineer in documented format. Specific attention shall be given to any signs of blade arcing.

e) All moving parts (that are recommended by the original equipment manufacturer to be lubricated) shall be lubricated using a lubricant complying with the requirements of the original equipment manufacturer.

f) The oil chamber shall be filled to the recommended level with new insulation oil in compliance with the abovementioned specifications.

g) Care shall be taken to handle, transport, and store insulation oil in accordance with the abovementioned specifications

h) The circuit breaker shall be closed and the circuit breaker trolley and panel shall be restored to the normal operational state.

20.5 Measurement and Payment

a) The unit of measurement and payment shall be the number of circuit breakers serviced in accordance with this procedure.

b) The tendered rate shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for supply, delivery and installation of the volume of new insulating oil required to fill the oil chamber to the recommended level.

21. Replacement of cover a plate for a medium voltage switchgear panel

21.1 Procedure Number RP21

21.2 Scope

This procedure covers the supply and installation of a cover plate for a medium voltage switchgear panel.

21.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

21.4 Task Description

a) The contractor shall supply and install a rear cable termination box cover plate for a switchgear panel.

b) The cover plate shall be designed to fit perfectly onto the existing switchgear panel. The plate shall be made of the same type of steel as the original switchgear cubicle, and it shall be painted with an equal or higher quality anti corrosive paint. The steel cover plate shall be secured onto the existing switchgear cubicle using bolts and washers to suit the existing bolt and nut arrangement of the switchgear panel.

c) The contractor shall obtain the exact dimensions of the switchgear panel and shall manufacture the cover plate in accordance with these dimensions.

21.5 Measurement and Payment

a) The unit of measurement shall be number of switchgear panels for which cover plates are supplied and installed.

22. Replacement of transformer earth conductor

22.1 Procedure Number RP22

22.2 Scope

This procedure covers the supply and installation of an earth conductor between a transformer and the substation integral earth bar.

22.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) SANS 1063 Earth rods and couplers

22.4 Task Description

a) The contractor shall supply, install and connect an earth conductor between the transformer and the substation integral earth bar.

b) The earth conductor used shall be a bare stranded copper conductor with a 70mm^2 cross sectional area.

c) The earth conductor shall be connected to the equipment and to the integral earth bar using properly sized connecting lugs.

22.5 Measurement and Payment

a) The unit of measurement shall be the number of transformers that are connected to the substation integral earth bar.

b) The tendered rate shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for the following:

i) The supply and installation of a 15m length of earth conductor as specified in this procedure.

ii) The supply and installation of properly sized connecting lugs and connecting bolts, nuts and washers.

23. Replacement of Transformer Oil Gaskets

23.1 Procedure Number RP23

23.2 Scope

This procedure covers the supply, delivery and installation of various types of insulating oil gaskets for power transformers. The existing oil gaskets shall be removed on site and replaced with new gaskets that shall be cut to suit the transformer.

23.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) ASTM F104-95: Standard Classification System for Non-metallic Gasket Materials

23.4 Task Description

a) Only personnel with proven experience of previous transformer oil gasket replacement tasks shall perform this procedure. The contractor shall supply the Engineer with proof of the experience on previous projects.

b) This procedures covers the replacement of the following types of gaskets on power transformers:

- main top gasket
- bushing gaskets (medium voltage)
- bushing gaskets (low voltage)
- sealing bolt / test plug gasket

The procedure for the replacement of the various types of gaskets are specified below. As part of this procedure (applicable to all types of gaskets specified) the contractor shall thoroughly clean the whole transformer and remove all oil spills and other dirt on the transformer's enclosure).

c) Main top gasket

i) The top gasket shall be removed and care shall be taken not to damage the gasket so that it may be used to determine the dimensions of the new gasket.

ii) The contractor shall supply and deliver new gasket material of sufficient quantity to cut a new gasket using a single sheet of gasket material. The contractor shall determine the dimensions of the transformer on site by means of measurement.

iii) The metal surfaces on the transformer enclosure and top cover plate on which the gasket is bedded shall be thoroughly cleaned and inspected for defects that may cause oil leaks. The contractor shall report any such defects to the Engineer.

iv) A new gasket shall be cut and installed to fit neatly on the transformer gasket area.

v) The gasket material supplied shall be a nitrile rubber compound of the Corkrite TF72 or equal and approved equivalent type according to ASTM F104-95. The thickness of the nitrile rubber sheet shall be 4.5mm. The contractor shall select the nitrile rubber sheet with a cork granule size that is in accordance with the manufacturer's specifications.

vii) The installation of the gasket shall be done strictly in accordance with the transformer and gasket material manufacturers' specifications.

viii) The contractor shall ensure that the transformer's top cover plate fastening bolts are tightened to the torque and in the sequence specified by the transformer manufacturer's specifications.

ix) The contractor shall familiarise himself with any requirements for the handling and or disconnection and reconnection of cables onto and from the transformer, and all such work shall be done as part of this procedure.

d) Bushing gasket (medium voltage)

This procedure applies to all three medium voltage bushings.

i) The same procedure shall be followed except that only the bushings shall be removed instead of other components as specified in the procedure for the main top gasket.

ii) The contractor shall be responsible for the removal of the conductors that are connected to the medium voltage bushings, and for the reconnection of these conductors on completion of the task.

e) Bushing gasket (low voltage)

This procedure applies to all four low voltage bushings.

i) The same procedure shall be followed except that only the bushings shall be removed instead of other components as specified in the procedure for the main top gasket.

ii) The contractor shall be responsible for the removal of the conductors that are connected to the low voltage bushings, and for the reconnection of these conductors on completion of the task.

f) Sealing bolt / test plug gasket

This procedure applies to sealing bolts and or test plugs on the transformer oil chamber that are sealed by means of oil gaskets.

i) The same procedure shall be followed except that only the sealing bolts and or test plugs shall be removed instead of other components as specified in the procedure for the main top gasket.

23.5 Measurement and Payment

a) The unit of measurement and payment shall be the number of sealing gaskets supplied and installed. In the case of bushing gaskets the unit of measurement shall be the number of three phase sets of bushings installed. (This means that one unit shall represent ll three (in the case of medium voltage bushings) or all

four (in the case of low voltage bushings) bushings of the transformer for which new gaskets were installed. The schedule of quantities shall specify the type of gaskets. The different types are the following:

i) Main top gasket

ii) Bushing gaskets (medium voltage)

iii) Bushing gaskets (low voltages)

iv) Sealing bolt / test plug gasket

b) The tendered rates shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for the following:

i) All the work associated with the shutting down of the transformer, the removal of the existing gasket(s), the installation of the new gasket(s), and the re-installation of the transformer's top cover plate and or other components.

ii) All the conductor handling work that may be required to complete this procedure.

24. Reparation of Transformer Bushing Insulation

24.1 Procedure Number RP24

24.2 Scope

This procedure covers the replacement of the covering insulation of transformer bushings with new insulating material.

24.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) SANS 122 Pressure sensitive adhesive tapes for electrical purposes.

24.4 Task Description

a) The contractor shall clean and remove all existing insulation material from the three medium voltage or low voltage bushings of the transformer, whichever is specified. The procedure shall apply to all the bushings in either the set of medium or the set of low voltage bushings whichever is specified.

b) The contractor shall install the following insulation material on all the bushings in the set:

i) After it has been cleaned and old insulating material removed, the bushings shall be taped with at least 1.5m of insulating putty. The insulating putty shall be on the Scotchfil Electrical Insulating Putty type or equal and approved equivalent. The tape thickness shall be 3.2mm and the width shall be 38mm. An oil-based insulating putty shall not be used.

ii) The insulation putty shall be covered with at least 4 layers self fusing rubber tape of the Scotch No. 23 tape or equal

and approved equivalent. Care shall be taken that this tape is not excessively stretched when applying it, as this may deform the insulation putty.

iii) The self fusing rubber tape shall be covered with at least 2 layers of adhesive colour coded PVC insulation take of the Scotch No. 35 type or equal and approved equivalent. The colour coding of the tape shall correspond to the bushing phases, and the colours used shall be red, white, blue and black (the latter colour for the earth conductor).

24.5 Measurement and Payment

a) The unit of measurement shall be the number of bushing sets (one set is equivalent to either three medium voltage bushings or four low voltage bushings) of which the insulation been restored. The sets shall be specified to be either one of the following:

i) Medium voltage bushings

ii) Low voltage bushings

25. Replacement of transformer dehydrating breather

25.1 Procedure Number RP25

25.2 Scope

This procedure covers the supply and installation of a new dehydrating breather on a power transformer.

25.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

25.4 Task Description

a) The contractor shall disassemble and remove the defective dehydrating breather from the transformer.

b) The contractor shall supply and install a complete new and unused dehydrating breather equal or equivalent to the existing unit of the transformer.

c) The contractor shall fill the new dehydrating breather with dehydrating agent and insulating oil to the levels specified by the manufacturer.

d) The replacement dehydrating breather shall be of the type specified as replacement by the original equipment manufacturer.

25.5 Measurement and Payment

a) The unit of measurement shall be the number of dehydrating breather units replaced.

b) The tendered rate shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for the supply and installation of the dehydrating agent and insulating oil that will be required as part of this task.

26. Sealing of a low voltage cable trench and sleeve section

26.1 Procedure Number RP26

26.2 Scope

This procedure covers the sealing of a low voltage cable trench and sleeve section on the side of a substation building.

26.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

26.4 Task Description

a) The contractor shall clean up the section of the cable trench inside the building by removing all ground and other material from around the existing cables. Sufficient ground and other material shall be removed to enable the back filling of the area around the cables and directly underneath the substation wall with the specified back filling material to be carried out.

b) After the cable trench has been cleaned up the cables shall be neatly laid out 50mm away from each other. If the cable trench dimensions do not allow such spacing then a lesser-optimised arrangement shall be used.

c) The area around the cables and directly underneath the substation wall shall be bricked up with a weak mortar mixture. The mortar shall be a sound, cement and water mixture. The contractor shall ensure that the mortar mixture is sufficiently weak to allow it to be easily broken up if additional cables are to be installed at a later stage.

d) The contractor shall not de-energise any of the cables during the process.

26.5 Measurement and Payment

a) The unit of measurement shall be the number of cable entry sections refurbished. One cable entry section refers to the collective set of holes/sleeves through one wall where cables enter a cable trench.

27. General repairs to low voltage wiring in distribution panels

27.1 Procedure Number RP27

27.2 Scope

This procedure covers the general repair of the wiring in the low voltage distribution kiosk of a substation.

27.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) SANS 1507: Electric cable with extruded solid dielectric insulation for fixed installations (300/500V to 1900/3300V)

27.4 Task Description

a) The contractor shall reconfigure all cable termination in order to neaten the wiring arrangement and cable terminations in the distribution kiosk. This work shall include the disconnection of cables, the repositioning of the circuit breakers, isolators and other devices, the rerouting of cables where required, and the reconnecting of the cables.

b) The contractor shall insulate and seal all unused cable terminations using appropriate electrical insulation and shall tie these cable terminations in a neat manner inside the distribution kiosk.

c) The contractor shall disconnect, install cable glands, and reconnect all cable terminations that are not fitted with cable glands.

d) The contractor shall disconnect, install cable termination lugs, and reconnect all cable terminations that are not fitted with cable termination lugs.

i) The cable glands shall be of the adjustable type, equal or similar to the Pratley gland and shall be suitable for use with PVC SWA PVC cables complying with the latest edition of SANS 1507. All glands shall be installed with non-deteriorating neoprene shrouds. For all gland installations on armoured cable, the outer sheath of the cable shall be cut back in accordance with the gland manufacturers' recommendations, so that a minimum of armouring is exposed between the gland and the outer sheath after gland installation. The shroud shall seal on the outer sheath of the cable.

ii) All cable termination lugs shall be bi-metallic aluminium-copper lugs, equal to or similar to SIMEL type ACX.

27.5 Measurement and Payment

a) The unit of measurement shall be a lump sum.

b) The tendered sum shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered sum shall also include full compensation for the supply and installation of all cable glands, terminating lugs and other wiring materials that shall be required as part of this task.

28. Replacement of Ammeters

28.1 Procedure Number RP28

28.2 Scope

This procedure covers the replacement of low voltage instrumentation ammeters in low voltage panels in substations and in miniature substations.

28.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) BS 89 Part 9, direct acting indicating analogue electrical measuring instruments and their accessories. Recommended test methods.

c) IEC 60051-1 (1997-12), IEC 60051-2 (1984-12), IEC 60051-8 (1984-12), IEC 60051-9 (1988-05)

28.4 Task Description

a) Each faulty ammeter shall be disconnected and removed form the kiosk or enclosure. The contractor shall ensure that no secondary circuits are open-circuited during this procedure.

b) The replacement ammeter shall be installed in the same position from which the faulty ammeter was removed. All circuits shall be reconnected using appropriately sized lugs on all wire terminations.

c) All ammeters supplied shall be maximum demand and instantaneous reading ammeters with maximum demand slave indicators. Ammeters shall be rated for the appropriate secondary current (1A or 5A) and shall be able to indicate up to 20% over full current rating.

d) Ammeters shall comply with the following specifications:

i) Ammeters shall be rated for the supply voltage and frequency which is 400/230V and 50Hz respectively. All the ammeters supplied shall be from the range of a single reputable supplier and shall preferably have the same face dimensions as the original ammeters. All ammeters shall comply with BS 89 Part 9 and/or IEC 60051.

ii) Ammeters shall be screened against magnetic interference and shall have anti-static against magnetic interference.

iii) Ammeters shall have anti-static impact resistant glass or "Macrolon" faces.

iv) Ammeters shall be insulated to achieve a 2kV insulation resistance to earth.

v) All instruments shall be splash proof and dust-proof unless more stringent requirements are specified for hazardous locations.

vi) Instruments shall be sufficiently resistant to vibration that may be encountered in the specific application.

vii) For normal environmental and supply conditions, instruments shall be suitable for use inside the limits specified in Tables III and VI of IEC 60051.

viii) All instruments shall be capable of withstanding overloads of continuous or short duration in accordance with section 8.3 of IEC 60051.

ix) Instruments shall be provided with studs for rear connection. Shrouds shall be provided to prevent accidental contact where instruments are to be installed in hinged panels of switchboards.

x) Ammeters shall have a moving iron element to indicate instantaneous values.

xi) Direct reading ammeters up to a maximum rating of 60 A may be used. Current transformer operated ammeters

shall be 5 A full scale, calibrated to read actual primary circuit currents. The current transformer ratio shall be indicated on the faceplate.

xii) A zero adjustment screw shall be provided.

xiii) Where combined maximum demand and indicating ammeters are specified, a bimetallic spiral element shall be provided in the same housing to indicate mean value over a 15 minute period.

xiv) The bimetal element shall drive a residual pointer to indicate maximum mean current between resettings. This pointer shall operate on the main scale and shall be of a distinctive colour. The pointer shall be resettable from the face of the meter.

xv) The bimetal element shall be designed to compensate for limits of ambient temperature between -20°C and 70°C.

xvi) Full load or rated current shall be clearly indicated, preferably with a red line. Unless specified to the contrary, a 100% condensed overscale shall be provided for instantaneous reading instruments and no overscale for combined maximum-demand ammeters.

xvii) The intrinsic error, expressed in terms of the fiducial value in accordance with IEC 60051, shall be class 1,5 for the instantaneous readings and class 2,5 for the mean maxima.

e) Each ammeter shall be supplied and installed with a faceplate with the correct current transformer scale ratio. The contractor shall verify the correct current transformer scale ratio prior to supplying and installing the ammeter.

f) The contractor shall do all modifications that may be required to fit the new ammeter in the existing space, including the supply and installation of fixing brackets and material.

28.5 Measurement and Payment

a) The unit of measurement shall be number of ammeters installed. The ammeter installation process shall be considered to include the removal of the existing ammeters.

29. Replacement of Voltmeters

29.1 Procedure Number RP29

29.2 Scope

This procedure covers the replacement of low voltage instrumentation voltmeters in low voltage panels in substations and in miniature substations.

29.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) BS 89 Part 9, direct acting indicating analogue electrical measuring instruments and their accessories. Recommended test methods.

c) IEC 60051-1 (1997-12), IEC 60051-2 (1984-12), IEC 60051-8 (1984-12), IEC 60051-9 (1988-05)

29.4 Task Description

a) Each faulty voltmeter shall be disconnected and removed form the kiosk or enclosure.

b) The replacement voltmeter shall be installed in the position from which the faulty voltmeter was removed. All circuits shall be reconnected using appropriate sized lugs on all wire terminations.

c) Voltmeters shall comply with the following specifications:

i) Voltmeters shall be rated for the supply voltage and frequency which is 400/230V and 50Hz respectively. All the voltmeters supplied shall be from the range of a single reputable supplier and shall preferably have the same face dimensions as the original voltmeters. All voltmeters shall comply with BS 89 Part 9 and/or IEC 60051.

ii) Voltmeters shall be screened against magnetic interference and shall have anti-static against magnetic interference.

iii) Voltmeters shall have anti-static impact resistant glass or "Macrolon" faces.

iv) Voltmeters shall be insulated to achieve a 2kV insulation resistance to earth.

v) All instruments shall be splash proof and dust-proof unless more stringent requirements are specified for hazardous locations.

vi) Instruments shall be sufficiently resistant to vibration that may be encountered in the specific application.

vii) For normal environmental and supply conditions, instruments shall be suitable for use inside the limits specified in Tables III and VI of IEC 60051.

viii) All instruments shall be capable of withstanding overloads of continuous or short duration in accordance with section 8.3 of IEC 60051.

ix) Instruments shall be provided with studs for rear connection. Shrouds shall be provided to prevent accidental contact where instruments are to be installed in hinged panels of switchboards.

x) Voltmeters shall have a moving iron element to indicate instantaneous values.

xi) A zero adjustment screw shall be provided.

d) Each voltmeter shall be supplied and installed with a faceplate with the correct voltage transformer scale ratio. The contractor shall verify the correct voltage transformer scale ratio prior to supplying and installing the voltmeter.

f) The contractor shall do all modifications that may be required to fit the new voltmeter in the existing space, including the supply and installation of fixing brackets and material.

29.5 Measurement and Payment

a) The unit of measurement shall be number of voltmeters installed. The voltmeter installation process shall be considered to include the removal of the existing voltmeters.

30. Replacement of Instrumentation Fuses

30.1 Procedure Number RP30

30.2 Scope

This procedure covers the replacement of instrumentation fuses as used in voltmeters and ammeters.

30.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

30.4 Task Description

a) The contractor shall replace the defective fuses with new unused fuses.

b) The fuses shall be of the type and rating as specified by the original equipment manufacturer.

30.5 Measurement and Payment

a) The unit of measurement shall be the number of fuses replaced.

31. Secure LV panels to floor

31.1 Procedure Number RP31

31.2 Scope

This procedure covers the securing of low voltage distribution panels to the floor of a substation building.

31.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

31.4 Task Description

a) The contractor shall secure all the low voltage distribution panels of the substation to the floor by means of appropriately sized anchor bolts, or by means of attachment to the cable trench metalwork, whichever is the most practical.

b) The contractor shall supply and install all anchor bolts, brackets and all other materials that will be required as part of this task.

31.5 Measurement and Payment

a) The unit of measurement shall be a lump sum.

32. Installation of LV cable clamps

32.1 Procedure Number RP32

32.2 Scope

This procedure covers the supply and installation of two cable clamps for securing two low voltage cables at their points of entry into low voltage distribution kiosks.

32.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

32.4 Task Description

This procedure applies to two low voltage power cables at the point of entry into low voltage distribution kiosks. The two cables are both PVC insulated four core copper conductors with a cross sectional area of 180mm^2. At present the cables or not clamped within the kiosks and the full weight of the vertical section of the cables rest on the termination bushings.

a) The contractor shall supply and install the two wooden cable clamps to support the weight of the cables by clamping onto the cable sleeve and securing onto the distribution kiosk. The clamps shall be shaped to facilitate the clamping onto the cable sleeves without damaging the sleeves.

b) The contractor shall ensure that the installation is done in such a manner that the weight of the two cables is carried by the clamps and not by the cable termination lugs and bushings.

32.5 Measurement and Payment

a) The unit of measurement shall be a lump sum.

33. Reinstallation of LV distribution board front panel

33.1 Procedure Number RP33

33.2 Scope

This procedure covers the reinstallation of the front cover panels of existing low voltage distribution boards. These panels have been removed from the distribution boards and the fastening bolts and screws are no longer in place.

33.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

33.4 Task Description

a) The contractor shall reinstall the front cover panels of the low voltage distribution board in the substation where these are missing.

b) The panels shall be secured by means of fastening bolts and brackets. Where possible the existing brackets, bolts and nuts of the original panels shall be used, however in cases where these are unusable the contractor shall manufacture, supply and install similar securing brackets, bolts, nuts and washers.

33.5 Measurement and Payment

a) The unit of measurement shall be a lump sum. The lump sum tendered shall include full compensation for the reinstallation of the cover panels in a single substation.

34. Replacement of DB board front cover panel

34.1 Procedure Number RP34

34.2 Scope

This procedure covers the replacement of a front cover panel for an existing wall mounted distribution board.

34.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

34.4 Task Description

a) The contractor shall supply and install a new cover panel for a twelve way wall mounted distribution board.

b) The contractor shall determine the exact dimensions of the front cover panel by measurement prior to the supply and installation thereof.

34.5 Measurement and Payment

a) The unit of measurement and payment shall be the number of replacement front cover panels supplied and installed.

35. Replacement of LV circuit breaker

35.1 Procedure Number RP35

35.2 Scope

This procedure covers the supply and installation of a three phase three pole moulded case circuit breaker.

35.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

35.4 Task Description

a) The contractor shall remove the defective circuit breaker from the circuit.

b) The contractor shall determine the rating of the defective circuit breaker and shall replace it with a new moulded case circuit breaker with the same ratings as that of the defective circuit breaker. The contractor shall reconnect the circuit to the new circuit breaker.

c) The type of circuit breaker is a moulded case three phase three pole circuit breaker. The circuit breaker shall be in compliance with the relevant SANS code.

35.5 Measurement and Payment

a) The unit of measurement shall be the number of moulded case circuit breakers supplied and installed.

36. Reparation of insulation on low voltage busbar

36.1 Procedure Number RP36

36.2 Scope

This procedure covers the insulation of an exposed section of low voltage busbar conductor.

36.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

36.4 Task Description

a) The contractors shall insulate the complete section of exposed busbar using the same procedure for the reparation of transformer bushing insulation (Procedure RP24).

36.5 Measurement and Payment

a) The unit of measurement shall be a lump sum.

37. Reparations and LV cable replacements at a miniature substation

37.1 Procedure Number RP37

37.2 Scope

This procedure covers the reparation of a cable trench at a miniature substation, and the replacement of sections of exposed low voltage power cables that were damaged by a veld fire.

37.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

37.4 Task Description

The miniature substation to which this procedure applies is installed on ground level in an outdoor fenced off area. Four low voltage power cables are connected to the miniature substation and are installed in a cable trench in the close proximity to the miniature substation. The cable trench section closest the miniature substation is not backfilled and the cables are therefore exposed. These cables have been exposed to a veld fire and this has resulted in damage to the outer sleeves and possibly to the internal insulation as well. The length of the exposed section of cable trench is approximately 2.5m.

a) The contractor shall expose the damaged parts of the cables by removing backfilling material from the cable trench up to the full length required therefore.

b) The contractor shall disconnect the four low voltage cables from the miniature substation and cut the exposed and damaged ends so that the damaged sections are completely removed.

c) The contractor shall supply and install four sections of replacement cable, four cable joints and four cable terminations for the jointing and reconnection of the four cable sections. The replacement cable sections shall be PVC insulated, PVC sleeved, steel wire armoured copper conductor cables with four cores and a cross sectional area equal to that of the existing cable sections.

d) The contractor shall backfill the cable trench with fine-grained sound in such a way that the cables are not damaged. The cables shall be completely covered by the backfilling material in order to prevent exposure to the atmosphere. The cables shall be installed at a minimum depth of 0.5m. The contractor shall excavate the cable trench if necessary to obtain this minimum cable depth.

e) The cable joints and cable terminations shall comply with the following specifications:

i) The cable joints shall be of the epoxy-resin type.

ii) The cable glands shall be of the adjustable type, equal or similar to the Pratley gland and shall be suitable for use with PVC SWA PVC cables complying with the latest edition of SANS 1507. All glands shall be installed with non-deteriorating neoprene shrouds. The cable glands shall be fitted with a nipple gasket and inner seal kit, rendering the gland suitable for type "e" equipment (increased safety equipment).

iii) For all gland installations on armoured cable, the outer sheath of the cable shall be cut back in accordance with the gland manufacturers' recommendations, so that a minimum of armouring is exposed between the gland and the outer sheath after gland installation. The shroud shall seal on the outer sheath of the cable.

iv) Bi-metallic aluminium-copper lugs, equal or similar to SIMEL type ACX, shall be used according to the manufacturer's specifications, where solid aluminium conductors are terminated onto copper busbars.

37.5 Measurement and Payment

a) The unit of measurement shall be a lump sum.

38. Replacement and or Reparation of MV Cable Terminations

38.1 Procedure Number RP38

38.2 Scope

This procedure covers the replacement and or reparation of medium voltage cable terminations at both oil filled and tar/bitumen filled cable termination boxes of indoor switchgear equipment.

38.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

38.4 Task Description

This procedure applies to the cable terminations of indoor switchgear units (T3's and ring-main units). These units are either oil filled or

tar/bitumen filled. Different procedures apply to the two cases, and these differences are specified in this procedure.

a) The following procedure applies to oil immersed cable terminations:

   i) The contractor shall drain the insulation oil from the oil chamber and shall remove the oil from site.

   ii) The contractor shall remove the cable from the cable termination box and shall clean the cable section in preparation for the reinstallation of the lead cable seal.

   iii) The contractor shall reposition the cable and shall reinstall the lead cable seal in accordance with generally accepted lead cable sealing practices. The seal shall be tested to ensure that it forms a tight oil seal between the cable and the cable termination panel.

   iv) The contractor shall reassemble the cable termination box and shall refill the oil chamber with new insulation oil. The insulation oil shall be in accordance with the insulation oil specifications as set out elsewhere in this document.

b) The following procedure applies to tar/bitumen immersed cable terminations :

   i) The contractor shall remove the cable termination cover panel and shall remove the cable termination from the cable termination box.

   ii) The contractor shall disassemble and remove the complete cable termination box.

   iii) The contractor shall manufacture and supply a new cable termination box. The new cable termination box shall be manufactured to fit in the place of the removed cable termination box, and shall be made of the same steel and painted with the same or higher quality anti-corrosive paint as that of the rest of the switchgear metal work. The new cable termination box shall be manufactured to contain a Raychem/Systol heat shrink type cable termination. The cable termination box shall be equipped with a cover panel that can be removed by removing four fastening bolts, thereby offering access to the cable terminations without removing the complete cable termination box.

   iv) The contractor shall cut off and remove a length of approximately 5m from the cable termination end of the cable.

   v) The contractor shall supply and install a new section of cable of the same type and size as the original cable. The contractor shall also supply and install a cable joint and cable termination to join the new cable section to the old cable and to terminate the cable section onto the switchgear bushings in the newly installed cable termination box.

   vi) The contractor shall supply and install a wooden clamp onto the cable at the bottom of the cable termination box to carry the weight of the cable, thereby preventing this weight from being carried by the switchgear bushings.

   vii) The contractor shall reinstall the cover plate of the new cable termination box.

viii) The cable joints and cable terminations shall be of Raychem/Systol or equal and approved type. The size of the cable joints and terminations shall be selected to suit the cable size.

ix) The manufacturer's installation procedures and instructions shall be strictly adhered to.

ix) In cases where earth continuity conductors are installed on existing cable sections, and where these sections are replaced in terms of this procedure, the Contractor shall supply and install a new earth continuity conductor of equal or larger cross-sectional area. The earth continuity conductor installed shall comprise stranded copper conductors.

x) The Contractor shall conduct all the tests as specified in sub clause HA 04.3 of this specification on completion of the cable termination installation.

xi) Upon request all jointers shall produce proof of training in the performing of cable joints.

38.5 Measurement and Payment

a) The unit of measurement shall be the number of cable terminations replaced and or repaired. The schedule of quantities shall specify the type of task to be performed. The two types of tasks are the following:

i) Reparation of oil immersed cable termination

ii) Replacement of tar/bitumen immersed cable termination

b) The tendered rate shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for the following:

i) The supply of the lead and lead sealing equipment (in the case of oil immersed cable terminations only).

ii) The supply and installation of a cable joint and cable termination (in the case of tar/bitumen immersed cable terminations only).

iii) The supply and installation of five meter section of medium voltage cable (in the case of tar/bitumen immersed cable terminations only).

iii) The design, manufacture, supply and installation of a complete new cable termination box (in the case of tar/bitumen immersed cable terminations only).

39. Replacement of a MV cable sections and the terminating of the cable

39.1 Procedure Number RP39

39.2 Scope

This procedure describes the replacement of a cable section between the transformer and switchgear unit of a substation building. The cable shall be terminated and reconnected onto the equipment at both cable ends.

39.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) SANS 97: Electric cables - impregnated-paper-insulated metal-sheathed cables for rated voltages from 3,3/3,3 kV up to19/33 kV (excluding pressure assisted cables)

c) SANS 1339: Electric cables: Cross-linked polyethylene (XLPE) – insulated cables for voltages from 3,8/6,6 kV to 19/33 kV

39.4 Task Description

a) The contractor shall disconnect and remove the existing medium voltage cable from between the transformer and the switchgear unit. The contractor shall remove and dismantle the existing cable termination box of the tar/bitumen immersed cable termination switchgear unit. (This work shall be done in the manner specified as part of procedure RP38).

b) The contractor shall design, manufacture, supply and install a new cable termination box for the switchgear unit. (This work shall be done in the manner specified as part of procedure RP38).

c) The contractor shall supply and install a new section of medium voltage copper conductor XLPE cable of the same cross-sectional area as that of the existing cable. The contractor shall install two new and unused cable terminations on the two ends of this cable for connection onto the existing equipment.

d) The contractor shall reconnect to the two cable terminations onto the transformer and switchgear unit respectively. The contractor shall supply and install two wooden cable clamps to carry the weight of the two respective cable ends.

e) The cable terminations shall be of Raychem/Systol or equal and approved type. The size of the cable terminations shall be selected to suit the cable size.

f) The contractor shall conduct all the tests as specified in sub clause HA 04.3 of this specification on completion of the cable termination installation.

g) Upon request the contractor shall produce proof of training in the performing of cable terminations.

h) The medium voltage cable shall be a three core, copper conductor, XLPE insulated individually copper tape screened, galvanised steel armoured, PVC served medium voltage cable.

39.5 Measurement and Payment

a) The unit of measurement shall be a lump sum.

b) The lump sum shall include full compensation for all aspects specified in clause HA 08. In addition to this, the lump sum shall also include full compensation for the following:

i) The supply and installation of a 20m length of XLPE medium voltage cable.

ii) The supply and installation of two cable joints.

iii) The design, manufacture, supply and installation of a complete new cable termination box.

40. Reinstallation of a LV cable in a distribution kiosk

40.1 Procedure Number RP40

40.2 Scope

This procedure covers the removal of an externally installed loose low voltage cable, and the replacement thereof with a new low voltage copper conductor.

40.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

40.4 Task Description

a) The contractor shall disconnect and remove the externally routed low voltage conductor.

b) The contractor shall supply and install a new conductor in the place of the existing conductor. The conductor shall be installed, routed and secured inside the distribution panel. The conductor shall be a four-core PVC insulated, PVC sleeved, copper conductor with a cross-sectional area of at least 50mm^2.

c) The conductor shall be terminated on both ends with appropriately sized cable glands and terminating lugs.

d) The cable glands shall be of the adjustable type, equal or similar to the Pratley gland and shall be suitable for use with PVC PVC SWA PVC cables complying with the latest edition of SANS 1507. All glands shall be installed with non-deteriorating neoprene shrouds. For all gland installations on armoured cable, the outer sheath of the cable shall be cut back in accordance with the gland manufacturers' recommendations, so that a minimum of armouring is exposed between the gland and the outer sheath after gland installation. The shroud shall seal on the outer sheath of the cable.

e) All cable termination lugs shall be bi-metallic aluminium-copper lugs, equal to or similar to SIMEL type ACX.

40.5 Measurement and Payment

a) The unit of measurement and payment shall be a lump sum.

b) The lump sum shall include full compensation for all aspects specified in clause HA 08. In addition to this, the lump sum shall also include full compensation for the following:

i) The supply and installation of a 5m length of copper conductor as specified in this procedure.

iii) The supply and installation of cable glands and cable terminating lugs.

HA 13 TECHNICAL DETAILS: SCHEDULED MAINTENANCE WORK

HA 13.01 This section contains the specifications for the scheduled maintenance procedures that are to be carried out during the three year contract period. The scheduled maintenance tasks shall commence at the specified frequency once the initial repair work has been completed. The contractor should note

that the tendered rate for each procedure shall include both the supply, delivery, installation, testing and commissioning of equipment and material, and the labour and other costs associated with the completion of the procedure.

HA 13.02 Scope of scheduled maintenance work.

HA 13.02.01 Monthly Maintenance Tasks

The following maintenance tasks shall be performed on a monthly basis:

SM01 Standalone Power Transformer Service
SM02 Miniature Substation Service
SM03 Pole-mounted Transformer Service
SM04 Distribution Substation Service

HA 13.03 All the scheduled maintenance work is specified in the following procedures:

1. Standalone Power Transformer Service

1.1 Procedure Number: SM01

1.2 Scope

This procedure describes the periodical service of standalone power transformers of ratings up to 200kVA. This procedure does not include the servicing of miniature substation transformers. The service includes the servicing of the dehydrating breathers (including the oil seal or bath).

1.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the following standard specifications, regulations and codes:

a) The original equipment manufacturer's specifications, and operation and maintenance instructions.

b) SANS 555: Standard Specification for Unused and reclaimed mineral insulating oil for transformers and switchgear (uninhibited)

c) BS 3523: Specification for granular desiccant silica gel impregnated with cobalt chloride.

1.4 Task Description

a) General Service

The contractor shall complete the following actions:

i) The transformer shall be checked for visible defects, and any such defects shall be reported in documented format to the Engineer.

ii) The contractor shall maintain the transformer in a clean and dust-free condition using safe methods of cleaning and dusting.

iii) The contractor shall check for and record any indication of oil leaks.

iv) The contractor shall check for and record any indication of cracked bushings.

v) The contractor shall maintain all cable terminations (MV and LV) in a good condition. All defects and deteriorated cable terminations shall be corrected and or replaced where necessary. Cable terminations shall be done in accordance with procedure RP13.

b) Dehydrating Breather Service

i) The contractor shall check the quantity and colour of the dehydrating agent (typically silica gel) and reactivate or replace it where necessary.

ii) The silica gel shall be considered to require replacement if its colour is pink or if the breather is not filled to the required level, and it shall be considered not to need replacement if its colour is deep blue and the breather is filled to the required level.

iii) Silica gel used for replacement shall be new silica gel and shall comply with BS 3523.

iv) The oil seal or bath at the base of the dehydrating breather shall be removed, cleaned out, and refilled with new insulation oil. The insulation oil used for this purpose shall be new insulation oil in compliance with SANS 555. The dehydrating breather shall be refilled with insulating oil to the level as prescribed in the manufacturer's maintenance instructions.

1.5 Measurement and Payment

a) The unit of measurement shall be the number of time a standalone power transformer is serviced. A single rate shall apply to all sizes of transformers, and the tendered rates shall be based on a transformer size of 200kVA. The unit rates shall be compiled and submitted in the point system format as specified elsewhere in the document.

b) The tendered rate shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for the following:

i) All work associated with the service of standalone power transformers, excluding the replacement of cable terminations, which shall be considered a separate payment item

ii) The supply of dehydrating breather and breather top up insulation oil as is required for the service of the dehydrating breather.

2. Miniature Substation Service

2.1 Procedure Number: SM02

2.2 Scope

This procedure describes the periodical service of miniature substations of ratings up to 630kVA.

2.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with original equipment manufacturer's specifications, and operation and maintenance instructions.

2.4 Task Description

a) Metal Enclosure and Plinth

i) The contractor shall check the enclosure and plinth for visible defects. All defects shall be recorded in documented format.

ii) The contractor shall maintain all parts of the miniature substation in a clean and dust free condition.

iii) The contractor shall check that the miniature substation is properly installed on its plinth and that it does not lean over in any direction.

iv) The contractor shall check the condition of door hinges and that panel doors open and close correctly.

v) The contractor shall ensure that padlocks are installed on all lockable panel doors.

b) Medium Voltage Compartment

i) The contractor shall check the MV compartment for visible defects. All defects shall be recorder in documented format.

ii) The contractor shall check all equipment components for looseness and bent or damaged brackets. All such defects shall be corrected.

iii) The contractor shall maintain all MV cable terminations in a good condition. All defects and deteriorated cable terminations shall be corrected and or replaced where necessary. Cable terminations shall be done in accordance with procedure RP13.

iv) All miniature substation fuses shall be checked for condition and to ensure that they are correctly rated. Should any fuse be blown and or be incorrectly rated, it shall be replaced with the correct fuse. All fuse replacements shall be recorded, and used fuses that are not blown shall be handed over to the Engineer.

c) Transformer Compartment

i) The transformer shall be checked for visible defects, and any such defects shall be reported in documented format to the Engineer.

ii) The contractor shall maintain the transformer in a clean and dust-free condition using safe methods of cleaning and dusting.

iii) The contractor shall check for and record any indication of oil leaks.

iv) The contractor shall check for and record any indication of cracked bushings.

v) The contractor shall maintain all cable terminations (MV and LV) in a good condition. All defects and deteriorated cable terminations shall be corrected and or replaced

where necessary. Cable terminations shall be done in accordance with procedure RP13.

d) Low Voltage Compartment

i) The transformer shall be checked for visible defects, and any such defects shall be reported in documented format to the Engineer.

ii) The contractor shall check all equipment components for looseness and bent or damaged brackets. All such defects shall be corrected.

iii) The contractor shall check all circuit breakers, isolators, fuse links and instrumentation for correct operation, and record and report all defects.

2.5 Measurement and Payment

a) The unit of measurement shall be the number of times a miniature substation is serviced. A single rate shall apply to all sizes of miniature substation, and the tendered rates shall be based on a size of 630kVA. The unit rates shall be compiled and submitted in the point system format as specified elsewhere in the document.

b) The tendered rate shall include full compensation for all aspects specified in clause HA 08. In addition to this, the tendered rate shall also include full compensation for all work associated with the service of miniature substations, excluding the replacement of cable terminations, which shall be considered a separate payment item.

3. Pole-mounted Transformer Service

3.1 Procedure Number: SM03

3.2 Scope

This procedure covers the service of pole-mounted transformers and the associated low voltage distribution kiosks.

3.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

3.4 Task Description

a) The pole-mounted transformer installation shall be inspected for visible defects, and any such defects shall be reported in documented format to the Engineer.

b) The contractor shall maintain the low voltage distribution kiosk in a clean, vermin and dust-free condition using safe methods of cleaning and dusting.

c) The contractor shall check the transformer for and record any indication of oil leaks.

d) The contractor shall check for and record any indication of cracked bushings.

e) The contractor shall check the continuity of the low and medium voltage earth installations.

3.5 Measurement and Payment

a) The unit of measurement shall be the number of times a transformer installation is serviced. The unit rates shall be compiled and submitted in the point system format as specified elsewhere in the document.

4. MV/LV Distribution Substation Maintenance Inspection

4.1 Procedure Number: SM04

4.2 Scope

The procedure comprises of a general inspection of the various MV/LV distribution substations. These substations are all brick buildings comprising of three sections: a MV section, a transformer section, and a LV section. The purpose of this procedure is to perform a routine inspection of the complete substation to determine the condition and status of equipment, and at the same time performing minor routine maintenance tasks.

4.3 Standard Specifications, Regulations and Codes

All work carried out and all equipment and material supplied in terms of this procedure shall comply with the original equipment manufacturer's specifications, and operation and maintenance instructions.

4.4 Task Description

The following items shall be inspected and serviced:

a) General defects inspection.

b) All rooms of the substation building shall be thoroughly cleaned using a broom to sweep the floor and other equipment to dust and clean equipment.

c) All luminaires and lamps and their fittings shall be maintained in a good working order. The contractor shall supply and install luminaires, lamps and their fittings as is required to have all this equipment operational at all times.

d) Low Voltage Distribution Board

The Low Voltage distribution board shall be kept in a clean and neat condition. The contractors shall inspect the low voltage distribution equipment and record all defects.

4.5 Measurement and Payment

a) The unit of measurement shall be the number of times a substation installation is serviced. The unit rates shall be compiled and submitted in the point system format as specified elsewhere in the document.

TECHNICAL SPECIFICATION

HB STANDBY POWER SYSTEMS

CONTENTS

HB 01 SCOPE

HB 01.01 This specification comprises all aspects regarding the repair and maintenance of standby power systems. The new standby power sources consist of:

i) One 137kVA diesel generator at Peka Bridge Port of Entry
ii) One 137 kVA diesel generator at Monantsa Pass Port of Entry

HB 01.02 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.

HB 02 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

HB 02.01 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.

HB 02.02 **SANS Specifications**

02.02.01 SANS 10400 : THE APPLICATION OF THE NATIONAL BUILDING REGULATIONS
02.02.02 SANS 10142 : WIRING CODE

HB 02.03 **Department of Public Works Specification PW 774**

HB 02.04 **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 1993: Construction Regulations, 2003 as promulgated in Government Gazette No 25207 and Regulation Gazette No 7721 of 18 July 2003 shall be adhere to.

HB 02.05 **Manufacturer's specifications and maintenance instructions**

HB 02.06 **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.

HB 03 OPERATING AND MAINTENANCE MANUALS

HB 03.01 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 seven sets of hard copies.

HB 03.02 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:

03.02.01 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

03.02.02 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.

03.02.03 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.

03.02.04 Maintenance Documentation

a) Recommended service intervals with service descriptions.
b) Projected service life of:
   - diesel engine to next overhaul
   - diesel engine starter batteries
c) Schedule of consumable spares.

HB 04 TEST AND INSPECTIONS PRIOR TO PRACTICAL COMPLETION OF REPAIR WORK

HB 04.01 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:

04.01.01 output phase voltages
04.01.02 output current per phase
04.01.03 insulation testing at 500V
04.01.04 system earthing resistance testing by means of Wheatstone bridge instrument
04.01.05 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.

HB 05 LOGGING AND RECORDING PROCEDURES

HB 05.01 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.

HB 05.02 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:

05.02.01 Monthly inspection and maintenance actions.
05.02.02 Scheduled services.
05.02.03 Breakdown / call out reports.
05.02.04 Major overhaul or battery replacements.

HB 06 MAINTENANCE TOOLS AND SPARES

HB 06.01 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.

HB 06.02 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.

HB 06.03 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 ∅ diesel hose (Peka Bridge)
10mm² battery jumper cables:
1 pair First Aid Kit
Industrial type wall mounted (aluminium) paper towel dispenser with paper cartridge per generator room similar or equal to "Kimberley Clark MP Wall Stand"

HB 07 QUALITY ASSURANCE SYSTEM

HB 07.01 Following formal approval of his Quality Assurance system by the Engineer to the Contractor shall implement the approved Quality Assurance system.

HB 07.02 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.

HB 08 RE-COMMISSIONING OF INSTALLATION

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

HB 09 REPAIR WORK TO STANDBY POWER INSTALLATIONS

HB 09.01 The various systems shall be repaired during the first phase of the repair and maintenance contract.

HB 09.02 The scope of the repair work shall include, but shall not be limited to the activities listed below.

HB 09.03 The Contractor shall record the repair actions in tabular format before the Contractor's responsibility for maintenance commences.

HB 09.04 Repair work shall be executed within the approved period for repairs.

HB 09.05 New equipment and material (eg. 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

HB 10 STANDBY GENERATORS: TECHNICAL DETAILS

HB 10.01 Installation description

Refer to the enclosed schedule:

ITEM No.	Locality	Auto/ Manual/ Switching		Operational Yes/No	Approx year of installation
1	Monantsa Pass	137KVA	Auto	Yes	2009
2	Peka Bridge	137kVA	Auto	Yes	2009

HB 10.02 **Scope of repair work: Generators**

HB 10.02.01 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 brush gear. Open alternator terminal box, clean and tighten terminations. Check and record earthing value as measured with resistance measuring instrument.

Service alarm and control 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 or equal to Duvalco MK3 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.

HB 10.02.02 Do witnessed dummy load test.

HB 10.02.03 Service change-over switchgear. Disassemble contactors and clean. Test operation following service.

HB 10.02.04 Add an 12/24 V DC fluorescent emergency light, with switch above the control
Control panel door of each generator installation.
The light shall be energised via a push button switch with adjustable run down timer (0 – 120 minutes)

HB 10.03 **Generator repair work: measurement and payment**

HB 10.03.01 **Repair plant room**

The unit of measurement shall be a lump sum.

The tendered rate shall include full compensation for the repair and upgrade of the plant room. This includes repair work on luminaires, doors, and locks including the fitting of new padlocks.

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

HB 10.03.02 **Service genset**

The unit of measurement shall be a lump sum.

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 as needed, opening and cleaning of alternator and alarm panel as well as the steam cleaning of the assembly as described in Clause HB 10.02.

HB 10.03.03 **Diesel engine service**

The unit of measurement shall be the number of mechanical services performed on diesel engines in the 20kW to 150kW 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 HB 10.02.

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.

HB 10.03.05 **Dummy load test**

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.

HB 10.03.06 **Change-over switchgear service**

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.

Service alarm and control 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.

HB 10.03.07 **Supply and install padlocks**

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.

HB 10.03.08 **Supply of diesel fuel**

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.

HB 10.03.09 **Supply of Tools and Spares**

The unit of measurement shall be a lump sum. The tendered rate shall include full compensation for the supply and delivery of the Tools and Spares specified.

HB 10.03.10 **Repair alarm sounder**

The unit of measurement shall be the number of alarm / flasher units installed. The tender rate shall include full compensation for the repair of the panel mounted 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.

HB 10.03.11 **Add 12/24V DC emergency light.**

The unit of measurement shall be the number of lights installed. The tender rate shall include full compensation for the supply and installation of all materials, brackets and fixings for the specified emergency light in full working order above the Control panel.

HB 10.03.12 **Supply and install fuel water separator**

The unit of measurement shall be the number of fuel/water separator units with automatic water dump installed.

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 MK 3 series.

HB 10.03.13 **Supply and install a fuel drip tray**

The unit of measurement shall be the number of fuel drip trays supplied and installed.

The tendered rate shall include full compensation for the manufacturing, supply and installation of a fuel drip tray as described in Clause HB 10.02

HB 10.03.14 **Supply and Install water jacket heater**

The unit of measurement shall be the number of water jacket heaters supplied and installed.

The tendered rate shall include full compensation for the installation of a water heater complete with a 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

HB 10.03.16 **Replace existing control panel**

The unit of measurement shall be a lump sum for the replacement of the existing control panel of a Standby Generator.

The tendered rate shall include full compensation for the removal of the existing control panel, manufacturing of the new control panel, installation, testing and commissioning as specified below.

1.1 Protection and Alarm Devices

All switchboards shall be equipped with protection and alarm devices as described below.

A circuit breaker and an adjustable current limiting protection relay must be installed for protection of the alternator. The protection relay shall be of the type with inverse time characteristics. The relay shall cause contactor to isolate the alternator and stop the engine.

Protection must be provided for overload, high engine temperature, low lubricating oil pressure, over speed, start-failure, low water level.

Individual relays with reset pushed are required, to give a visible signal and stop the engine when any of the protective devices operate. In the case of manual operation of standby sets, it shall not be possible to restart the engine.

The indicators and re-set pushes must be marked in both official languages respectively.

"OVERLOAD"	"OORLAS"
"TEMPERATURE HIGH"	"TEMPERATUUR HOOG"
"OIL PRESSURE LOW"	"OLIEDRUK LAAG"
"OVER-SPEED"	"OORSPOED"
"START FAILURE"	"AANSITFOUT"
"LOW WATER LEVEL"	"LAE WATERVLAK"

In addition two relays with reset pushes must be fitted giving and audible and visible signal when:

(a) The fuel level in the service tank is low. The reset push of this relay must be marked "FUEL LOW" - "BRANDSTOF LAAG".

In addition, a low-low level sensor must be provided. At this level the engine must stop to prevent air entering the fuel system.

(b) The battery charger failed. The reset push of this relay must be marked "CHARGER FAIL" - "BATTERYLAAIER FOUTIEF".

This is also applicable to the engine driven generator/alternator.

All relays must operate an alarm hooter. A pushbutton must be installed in the hooter circuit to stop the audible signal, but the fault indicating light on the control panel must remain lit until the fault has been rectified.

An on/off switch is not acceptable. After the hooter has been stopped, it must be re-set automatically, ready for a further alarm.

The hooter must be of the continuous duty and low consumption type. Both hooter and protection circuits must operate from the battery.

Potential free contacts from the alarm relay must be brought down to terminals for remote indication of alarm conditions.

A test pushbutton must be provided to test all indicators lamps.

1.2 Marking

All labels, markings or instructions on the switchgear shall be in both official languages.

1.3 Earthing

An earth bar must be fitted in the switchboard, to which all non-current carrying metal parts shall be bonded.

The neutral point of the alternator must be solidly connected this bar by means of a removable link labelled "EARTH" "AARD". Suitable terminals must be provided on the earth bar for connection of up to three earth conductors, which will be supplied and installed by others.

1.4 Operation Selector Switch

A four position selector switch must be provided on the switchboard marked "AUTO", "MANUAL", "TEST" and "OFF" - "AUTO", "HANDBEHEER" "TOETS" and "AF".

With the selector on "AUTO", the set shall automatically start and stop, according to the mains supply being available or not.

With the selector on "TEST", it shall only be possible to start and stop the set with the pushbuttons, but the running set shall not be switched to the load.

With the selector on "MANUAL", the set must take the load when started with the pushbutton, but it must not be possible to switch the set on to the mains, or the mains onto the running set.

With the selector on "OFF", the set shall be completely disconnected from the automatic controls, for cleaning and maintenance of the engine.

1.5 Automatic Change-over System

A fully automatic change-over system must be provided to isolate the mains supply and connect the standby set to the outgoing feeder in case of a mains failure and reverse this procedure on return of the mains.

1.6 By-pass Switch and Main Isolator

The switchboard shall be equipped with an on-load isolator to isolate the mains and a manually operated on-load by-pass switch, which shall either connect the incoming mains to the automatic control gear or directly to the outgoing feeder. In the latter position the automatic control gear, including the main contractors, shall be isolated for maintenance purposes. It shall not be possible to start the engine except with the selector switch in the "TEST" position.

It is required that this by-pass switch and mains isolator be mounted away from the automatic control gear, in a separate compartment either on the side or in the lower portion of the switchboard cubicle, and that the switches operated from the front of the compartment.

1.7 Start Delay

Starting shall be automatic in event of a mains failure. A 0-15 second adjustable start delay timer shall be provided to prevent start-up on power trips or very short interruptions.

1.8 Stop Delay

A stop delay with timer is required for the set, to keep the set on load for an adjustable period of one to sixty seconds after the return of the mains supply, before changing back to the supply. An additional timer shall keep the set running for a further adjustable cooling period of 5 to 10 minutes at no-load before stopping.

2. INSTALLATION

Except for the supply of the incoming mains cable and outgoing feeder cables, the tenderer must include for the complete installation and wiring of the plant ready for operation, including the connection of the incoming cable and outgoing feeder cables.

The connecting of the cable and control cabling to the generator and the control terminals in the LV board remains the responsibility of the tenderer.

3. CONTROL FACILITIES

3.1 Two key operated switches, labelled as follows, shall be fitted on the generator control panel, located at the generator:

(a) *GEN AUTO START* — This switch shall have 2 positions. In the *Auto Start* position, the changeover sequence shall operate automatically as described. In the *Gen. Locked Out* position, the changeover sequence shall not be initiated if a mains fail situation occurs. Remote alarm indication (on the control panel) is required if the switch is in the latter position.

(b) *SIMULATE MAINS FAIL* — This switch shall have 2 positions. In the *Simulate* position, a main failure shall be simulated. In the *Normal* position, the system is set to the normal auto standby mode.

(C) MANUAL START & STOP

Auxiliary supplies for the change over control circuiting must be supplied from the 24 V generator batteries.

3.2 A system schematic diagram (A2 size), indicating the phase failure sensing circuit and the generator change over and control circuit, shall be prepared and mounted on the main switch room wall behind 4 mm clear Perspex.

3.3 Statutory warning notices shall be installed inside the plant room and on the entrance doors.

3.4 The following pilot lights, with a lamp test facility, shall be provided on the generator control panel:

- Load on normal supply : Green
- Load on emergency supply : Blue
- Mains failure : Amber
- Engine run down cycle : Blue
- Genset in standby mode : Green
- Water jacket heater failure : Amber
- Low fuel level : Amber
- Engine start failure : Red
- Auto-start disabled : Red

- High engine temperature : Red
- Battery charger failure : Red
- Engine overspeed : Amber
- Engine underspeed : Amber
- Overvoltage : Amber
- Undervoltage : Amber

3.5 Critical alarms will shut the engine down. The critical (red) and non-critical (amber) alarms shall be wired in series. These two circuits shall each energise a relay in the normal mode. A 40 W 24 V siren and 24 V xenon strobe shall be mounted above the doors outside the plant room. These shall be activated in case of an alarm condition (critical and non critical). Each of these relays shall be employed to provide the "generator critical" and "generator fault" alarms on the remote alarm panel.

3.6 Provision will be made to connect an alarm annunciator panel to voltage free contacts for each of the above alarms.

3.7 All timer relays shall be labelled according to their function, for ease of maintenance and future modifications, e.g.

- "Engine run down : Timer T7"; or
- "Mains return delay : Timer T5".

3.8 All sensors and timers shall be of the Rhomberg Slimline plug-in type, control relays shall be Omron.

HB 11 MAINTENANCE OF THE INSTALLATION

HB 11.01 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.

HB 11.02 The following maintenance actions will be required under the contract:

12.02.01 Routine preventative maintenance

12.02.02 Corrective maintenance

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

HB 11.03 The maintenance schedules and frequency of services and maintenance activities hall 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.

HB 11.04 Generator maintenance: scope of work.

HB 11.04.01 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.
- abnormal speed.
- synchronising failure (if applicable)
- cooling water pump failure.
- cooling tower fan failure (if applicable).
- low battery voltage.
- low fuel day tank.
- fuel pump failure.
- low fuel bulk tank (if applicable).

(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.

HB 11.04.02 **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 100 hours

HB 11.04.03 **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.

HB 11.05 **Generator maintenance: measurement and payment**

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

PARTICULAR SPECIFICATIONS

PHB EMERGENCY GENERATOR SET

SECTION 1 – GENERAL

TABLE OF CONTENTS

SECTION 1 – GENERAL

1. INTENT OF DOCUMENT

The specification is intended to cover the complete installation of the generator plant and associated electrical work. The minimum equipment requirements are outlined, but do not cover all the details of design and construction. Such details are recognised as being the exclusive responsibility of the contractor.

In all cases where a device or part of the equipment is referred to in the singular, it is intended that such reference shall apply to as many devices as are required to complete the installation.

2. STANDARDS AND CODES

All work and equipment shall be in accordance with the requirements of BS5514 and shall comply with the Occupational Health and Safety Act, No 85 of 1993 and current regulations of all other codes applicable to this work.

All equipment shall be Y2K compliant.

3. REGULATIONS

The installation shall be erected and tested in accordance with the following Acts and regulations:

a) The latest issue of SANS 10142-1: "Code of Practice for the Wiring of Premises".

b) The Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended.

c) The Fire Brigade services Act 1993 Act 99 of 1987 as amended.

d) Department of Public Works: Standard Specification for Standby Generators.

4. SCOPE OF WORK

Supply, delivery and installation of the complete emergency generator set specified in this document.

There is an existing plant room at the Various Ports of Entry. The contractor shall ensure that the space allowed is sufficient for the installation of the generator set and that the ventilation of the plant room is adequate. If any changes to the building have to be made, the contractor must inform the consulting engineer in writing.

5. CO-ORDINATION

Due to the nature of the installation, a fixed sequence of operation is required to properly install the complete generator plant. The work shall be closely scheduled in order not to delay the entire project.

The contractor shall familiarise himself with the generator room and pump station and shall examine the existing plant.

6. TEST CERTIFICATES AND INSPECTIONS

The following tests are to be carried out:

(a) At the supplier's premises, before the generating set will be delivered to site Representatives of the Department may be present during the test to satisfy them that the generating set complies with the specification and delivers the specified output. The test must be carried out in accordance with BSS 5514, Part 2 and 3. The Department must be timeously advised of the date for the test.

(b) After completion of the works and before first delivery is taken, a full test will be carried out on the installation for a period of sufficient duration to determine the satisfactory working thereof. During this period the installation will be inspected and the contractor shall make good, to the satisfaction of the Representative/Agent, any defects which may arise.

(c) The Contractor shall provide all instruments and equipment required for testing and any water, power and fuel required for the commissioning and testing of the installation prior to final acceptance.

(d) Test reports of both tests as specified under (a) and (b) are to be submitted to the Department.

7. GUARANTEE AND MAINTENANCE

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

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

The Contractor shall maintain the plant in good working condition for the full twelve month period to the final delivery of the installation. However, should the Contractor fail to hand over the plant in good working order on the expiry of the specified twelve month period, the Contractor shall be responsible for further monthly maintenance until final delivery is taken.

During this period the contractor will undertake to arrange that the plant be inspected at least once per month by a qualified member of his staff who shall: -

(a) Report to the Officer-in-charge, keeping the maintenance records, and enter into a log book the date of the visit, the tests carried out, the adjustments made, and any further details that may be required.

(b) Grease and oil moving parts, where necessary. Check for gas or fluid leaks.

(c) Check the air filter and, when necessary, clean the filter and replace filter oil.

(d) Check the lubricating oil and top-up when necessary.

(e) As the first service in terms of running hours has been reached as stipulated by the manufacturers, drain the sump and refill with fresh lubricating oil. The reading of the

hour meter on the switchboard will be taken to establish the number of hours run by the plant.

Under this heading only the cost of the actual oil used, shall be charged as an extra on the monthly account.

(f) Clean the lubricating oil filter and/or replace the filter element at intervals recommended by the engine manufacturer, the cost of a new filter element to be charged as an extra on the monthly account.

(g) Check and when necessary adjust the valve settings and the fuel injection equipment.

(h) Check the battery and top-up the electrolyte when necessary.

(i) Test-run the plant for 0,5 hour and check the automatic starting with simulated faults on the mains, the proper working of all parts, including the electrical gear the protective devices with fault indicators, the changeover equipment and the battery charger. Make the necessary adjustments.

(j) Report to the Department and to the Contractor on any parts that become unserviceable through fair wear and tear, or damaged by causes beyond the control of the Contractor.

The Contractor on receiving the report shall immediately submit a detailed quotation for the repair or replacement of such parts to the Department.

(k) Advise the Department when it has become necessary to de-carbonise the engine and submit a quotation for this service.

(l) Top up the radiators water, if applicable.

(m) Clean the plant and it's components.

8. MATERIALS AND WORKMANSHIP

(a) The work throughout shall be executed to the highest standards and to the entire satisfaction of the Representative/Agent who shall interpret the meaning of the Contract Document and shall have the authority to reject any work and materials, which, in his judgement, are not in full accordance therewith. All condemned material and workmanship shall be replaced or rectified as directed and approved by the Engineer.

(b) All work shall be executed in a first-class manner by qualified tradesman.

(c) The Contractor shall warrant that the materials and workmanship shall be of the highest grade, that the equipment shall be installed in a practical and first-class manner in accordance with the best practices and ready and complete for full operation. It is specifically intended that all material or labour which is usually provided as part of such equipment as is called for and which is necessary for its proper completion and operation shall be provided without additional cost whether or not shown or described in the Contract Document.

(d) The Contractor shall thoroughly acquaint himself with the work involved and shall verify on site all measurements necessary for proper installation work. The Contractor shall also be prepared to promptly furnish any information relating to his own work as may be necessary for the proper installation work and shall co-operate with and co-ordinate the work of others as may be applicable.

(e) All components and their respective adjustment, which do not form part of the equipment installation work, but influence the optimum and safe operation of the equipment shall be considered to form part of, and shall be included in the Contractor's scope of works.

(f) All control equipment and serviceable items shall be installed and positioned such that they will be accessible and maintainable.

(g) The Contractor shall make sure that all safety regulations and measures are applied and enforced during the installation and guarantee periods to ensure the safety of the public and the User Client.

(h) The Contractor is to include for all scaffolding required to complete the work required.

9. IMPORTED CONTENT

This equipment will not be subject to fluctuations in the rate of exchange.

However, should the Contractor choose to be protected against fluctuations in the rate of exchange on imported equipment, the following conditions will apply:

a) The Materials Offered Ex-Import (Annexure A), which forms part of this tender document, must be completed by the Contractor.

b) Any fluctuations in the rate of exchange will be for the account of the Government and shall be calculated from a date seven (7) days prior to the date of the Contractor's tender to a date seven (7) days after receipt by the Contractor's bank of the negotiable bill of lading or the exporter's invoice, provided this latter date is not later than 30 days after the date of payment. Thereafter, fluctuations in the rate of exchange shall not be for the account of the Government.

10. BROCHURES

Detailed brochures of all equipment offered shall be presented together with the tender documents.

11. SUBMISSIONS

11.1 The following information must accompany the tender documents

(a) Full particulars, performance curves and illustrations of the equipment offered, must be submitted with the Tender.

(b) The design of the control system to comply with the requirements for automatic starting, stopping, interlocking and isolation as specified.

(c) Curves furnished by the engine makers, showing the output of the engine offered against the speed, for both intermittent and continuous operation as well as fuel consumption curves when the engine is used for electric generation.

(d) Electronic Starter specifications, voltage and torque curves.

11.2 The successful Tenderer must, as soon as possible after receipt of the order, submit detailed drawings and wiring diagrams of the plant and the switchgear these shall also include proposed room layouts:

(i) Layout of generator room, indicating genset, day tank, control panel and main distribution board position as well as cable routing.

(ii) Layout of pump room, indicating pump MCC, electronic starter cabinets, interlinking cables as well as pump supply cable routing.

SPECIFICATION FOR THE SUPPLY DELIVERY AND INSTALLATION OF AN EMERGENCY GENERATOR SET

SECTION 2 – EQUIPMENT REQUIREMENTS

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SECTION 2 – EQUIPMENT REQUIREMENTS

1. ENGINE

1.1 General

The engine must comply with the requirements as laid down in BS 5514 and must be of the atomised injection, compression ignition type, running at a speed not exceeding 1500 r.p.m. The engine must be amply **rated** for the required electrical output of the set, when running under the site conditions. The starting period for either manual or automatic switching-on until the taking over by the generating set, in one step, of a load equal to the **specified** site electrical output, shall not exceed 15 seconds. This must be guaranteed by the Tenderer.

Turbo-charged engines will only be accepted if the Tenderer submits a written guarantee that the engine can deliver full load within the specified starting period.

1.2 Rating

The set shall be capable of delivering the specified output continuously under the site conditions, without overheating. The engine shall be capable of delivering an output of 110 % of the specified output for one hour in any period of 12 hours consecutive running in accordance with BS 5514.

1.3 De-Rating

The engine must be de-rated for the site conditions as set out in the Technical Specification.

The de-rating of the engine for site conditions shall be done strictly in accordance with BS 5514 of 1977 as amended to date. Any other methods of de-rating must have the approval of the Department and must be motivated in detail. Such de-rating must be guaranteed in writing and proved by the successful Tenderer at the site test.

1.4 Starting and Stopping

The engine shall be fitted with an electric starter motor and be easily started from cold, without the use of any special ignition devices under summer as well as winter conditions.

Tenderers must state what arrangements are provided to ensure easy starting in cold weather. Full details of this equipment must be submitted. In the case of water cooled engines, any electrical heaters shall be thermostatically controlled. The electrical circuit for such heaters shall be taken from the control panel, and must be protected by a suitable circuit breaker.

1.5 Starter Battery

The set must be supplied a fully charged lead-acid type battery, complete with necessary electrolyte. The battery must have sufficient capacity to provide the starting torque stipulated by the engine makers. The battery capacity shall not be less than 120 Ah and shall be capable of providing three consecutive start attempts from cold and thereafter a fourth attempt under manual control of not less than 20 seconds duration each. The battery must be of the heavy duty "low maintenance" type, house in a suitable battery box.

1.6 Cooling

The engine may be either air or water cooled. In the case of water-cooling, a built-on heavy duty, tropical type pressurised radiator must be fitted. Only stand-by sets that are water cooled shall have electric heaters.

For either method of cooling, protection must be provided against running at excessive temperatures. The operation of this protective device must give a visual and audible indication on the switchboard on the switchboard. Water-cooled engines shall in addition be fitted with a low water cut-out switch, installed in the radiator, to switch the set off in the event of a loss of coolant. The protection shall operate in the same way as the other cut-outs (e.g. low oil pressure). All air ducts for the cooling of the engine are to be allowed for. The air shall be supplied from the cooling fan cowling/radiator face to air outlet louvers in the plant room wall.

1.7 Lubrication

Lubrication of the main bearings and other important moving parts shall be by forced feed system. An automatic low oil pressure cut-out must be fitted, operating the stop solenoid on the engine and giving a visible and audible indication on the switchboard.

1.8 Fuel Pump

The fuel injection equipment must be suitable for operation with the commercial brands of diesel fuel normally available in South Africa.

1.9 Fuel Tank

A fuel tank shall be installed in the plant room. The tank shall have sufficient capacity for standby sets to run the engine on full load for a period of 12 hours. The fuel tank shall be a free standing type.

A water trap be fitted in the fuel pipeline from the tank to the engine.

The tank shall be fitted with a suitable filter, a full height gauge glass, "low fuel level" alarm, giving an audible and visible signal on the switchboard as well as a low-low fuel level cut-out.

An electrically operated pump with sufficient length of oil resistant hose to reach 2m beyond the door, shall be supplied, for each set for filling the fuel tank/s from 200 litre drums.

The interconnection fuel piping shall consist of copper tubes and the connection to vibrating components shall be in flexible tubing with armoured covering.

1.10 Governor

The speed of the engine shall be controlled by a governor in accordance with class A2 of BS 5514 of 1977 if not otherwise specified in the Technical Specification.

The permanent speed variation between no load and full load shall not exceed 4,5% of the normal engine speed and the temporary speed variation shall not exceed 10% External facilities must be provided on the engine, to adjust the normal speed setting by ± 5% at all loads zero and rated load.

1.11 Flywheel

A suitable flywheel must be fitted, so that lights fed from the set will be free from any visible flicker.

The cyclic irregularity of the set must be within the limit laid down in BS 5514 of 1977.

1.12 Exhaust Silencer

It is essential to keep the noise level as low as possible. An effective exhaust silencing system of the residential type must be provided.

The exhaust pipe shall be installed in such a way that the expelled exhaust fumes will not cause discomfort to the public. The exhaust pipe must be flexibly connected to the engine to take up vibrations transmitted from the engine, which may cause breakage. The exhaust piping and silencer shall be lagged to reduce the heat and noise transmission into the plant room and shall be protected against the ingress of driving rain at 45° to the horizontal. The exhaust pipe must extend 0,5m above the roof gutters. It must be secured by flanges both sides of the wall at the point of exit. These flanges must be clamped to the wall with bolts through the wall.

1.13 Accessories

The engine must be supplied complete with all accessories, air and oil filters, 3 instruction manuals, spare parts lists, the first fill of all lubricating oils, fuel, etc.

2. Alternator

2.1 General

The alternator shall be of the self excited brush less type, with enclosed ventilated drip proof housing and must be capable of supplying the specified output continuously with a temperature rise not exceeding the limits laid down in BS 5000 for rotor and stator windings.

The alternator shall be capable of delivering an output of 110% of the specified output, for one hour in any period of 12 hours consecutive running.

Both windings must be fully impregnated for tropical climate and must have an oil resisting finishing varnish.

2.2 Regulation

The alternator must preferably be self-regulated without the utilisation of solid state elements. The inherent voltage regulation must not exceed plus or minus 5% of the nominal voltage specified, at all loads with the power factor between unity and 0,8 lagging and within the driving speed variations of 4,5% between no-load and full load.

2.3 Performance

The excitation system shall be designed to promote rapid voltage recovery following the sudden application of the load. The voltage shall recover to within 5% of the steady state within 300 mili-seconds following the application of full load and the transient voltage dip shall not exceed 18%.

2.4 Coupling

The engine and alternator must be directly coupled by means of a high quality flexible coupling, equal and similar to the "HOLSET" type.

3. Switchboard

3.1 General

A switchboard must be supplied and installed to incorporate the equipment for the control and protection of the generating set and battery charging.

The switchboard must conform to the specification as set out in the following paragraphs.

3.2 Construction

The switchboard shall be a totally enclosed, floor mounted unit, fabricated from steel panels, carried on and-substantial angle iron framework.

The board shall be flush fronted and all equipment to be mounted behind the front plate, on suitable supports.

All equipment, connections and terminals shall be easily accessible from the front. The front panels may be either hinged or removable and fixed with studs and chromium-plated cap nuts. Self tapping screws shall be used in the construction of the board.

All pushbuttons, pilot lights, control switches, instrument and control fuses, shall be mounted on hinged panels with the control wires in flexible looms.

The steelwork of the boards must be thoroughly de-rusted, primed with zinc chromate and finished with two coats of signal red quality enamel, or a baked powder epoxy coating.

Suitably rated terminals must be provided for all main circuits and the control and protection circuits. Where cable lugs are used, these shall be crimped onto the cable strands. Screw terminals shall be of the type to prevent spreading of cable strands. All terminals shall be clearly marked.

For the control wiring, each wire shall be fitted with a cable or wire marker of approved type, and numbering of these markers must be shown on the wiring diagram on the switchboard. Control wiring shall be run in PVC trunking. The trunking shall be properly fixed to the switchboard steelwork. Adhesives shall not be acceptable for the fixing of trunking or looms.

The automatic control and protection equipment shall be mounted on a separate easily replaceable small panel with printed circuits. The equipment shall mainly be the "solid state" type. After mounting the equipment on the panel, the rear of this panel shall be sealed with epoxy-resin. However, other proven control systems may also be considered, but must be described in detail.

All equipment on the switchboard, such as contactors, isolators, busbars, etc., shall have ample current carrying capacity to handle at least 110% of the alternator full load current.

3.3 Protection and Alarm Devices

All switchboards shall be equipped with protection and alarm devices as described below.

A circuit breaker and an adjustable current limiting protection relay must be installed for protection of the alternator. The protection relay shall be of the type with inverse time characteristics. The relay shall cause contactor to isolate the alternator and stop the engine.

Protection must be provided for overload, high engine temperature, low lubricating oil pressure, over speed, start-failure, and low water level.

Individual relays with reset pushed are required, to give a visible signal and stop the engine when any of the protective devices operate. In the case of manual operation of standby sets, it shall not be possible to restart the engine.

The indicators and re-set pushes must be marked in both official languages respectively.

"OVERLOAD"	"OORLAS"
"TEMPERATURE HIGH"	"TEMPERATUUR HOOG"
"OIL PRESSURE LOW"	"OLIEDRUK LAAG"
"OVER-SPEED"	"OORSPOED"
"START FAILURE"	"AANSITFOUT"
"LOW WATER LEVEL"	"LAE WATERVLAK"

In addition two relays with reset pushes must be fitted giving and audible and visible signal when:

(a) The fuel level in the service tank is low. The reset push of this relay must be marked "FUEL LOW" - "BRANDSTOF LAAG".

In addition, a low-low level sensor must be provided. At this level the engine must stop to prevent air entering the fuel system.

(b) The battery charger failed. The reset push of this relay must be marked "CHARGER FAIL" - "BATTERYLAAIER FOUTIEF".

This is also applicable to the engine driven generator/alternator.

All relays must operate an alarm hooter. A pushbutton must be installed in the hooter circuit to stop the audible signal, but the fault indicating light on the control panel must remain lit until the fault has been rectified.

An on/off switch is not acceptable. After the hooter has been stopped, it must be re-set automatically, ready for a further alarm.

The hooter must be of the continuous duty and low consumption type. Both hooter and protection circuits must operate from the battery.

Potential free contacts from the alarm relay must be brought down to terminals for remote indication of alarm conditions.

A test pushbutton must be provided to test all indicators lamps.

3.4 Manual Starting

Each switchboard shall be equipped with two pushbuttons marked "START" and "STOP" for manual starting and stopping of the set.

3.5 Battery Starting Equipment

Each switchboard shall be equipped with battery charging equipment.

The charger shall operate automatically in accordance with the state of the battery and shall generally consist of an air-cooled transformer, a full wave solid state rectifier, and the necessary automatic control equipment of the constant voltage system.

The charger must be fed from the mains. An engine driven alternator must be also a provided for charging the battery while the set is operational. Failure of this alternator must also activate the battery charger failure circuit.

3.6 Switchboard Instruments

Each generating set shall have a switchboard equipped as follows:

(a) One flush square dial voltmeter, reading the alternator voltage, scaled as follows:

(i) 0-300V for single phase generators.
(ii) 0-500V for three phase generator. In this case a six position and off selector switch must be installed for reading all phase and phase to neutral voltages.

(b) A flush square dial combination maximum demand and instantaneous ampere meter for each phase, with resettable pointer suitably scaled 20% higher than the alternator rating. A red arc stripe above scale markings from 0-20A and a red radial line through the scale at full-load current shall be provided. These instruments shall be supplied complete with the necessary current transformer.

(c) One flush square dial vibrating type frequency meter, indicating the alternator frequency.

(d) A six digit running hour meter with digital counter, reading the number of hours the plant has been operating. The smallest figure on this meter must read $^1/_{10}$ hour.

(e) Fuses or m.c.b.'s for the potential voltage circuits of the meters.

(f) One flush square dial ampere meter suitably scaled for the battery charging current.

(g) One flush square dial voltmeter with a spring loaded pushbutton or switch for the battery voltage.

3.7 Marking

All labels, markings or instructions on the switchgear shall be in both official languages.

3.8 Earthing

An earth bar must be fitted in the switchboard, to which all non-current carrying metal parts shall be bonded.

The neutral point of the alternator must be solidly connected this bar by means of a removable link labelled "EARTH" "AARD". Suitable terminals must be provided on the earth bar for connection of up to three earth conductors, which will be supplied and installed by others.

3.9 Operation Selector Switch

A four position selector switch must be provided on the switchboard marked "AUTO", "MANUAL", "TEST" and "OFF" - "AUTO", "HANDBEHEER" "TOETS" and "AF".

With the selector on "AUTO", the set shall automatically start and stop, according to the mains supply bing available or not.

With the selector on "TEST", it shall only be possible to start and stop the set with the pushbuttons, but the running set shall not be switched to the load.

With the selector on "MANUAL", the set must take the load when started with the pushbutton, but it must not be possible to switch the set on to the mains, or the mains onto the running set.

With the selector on "OFF", the set shall be completely disconnected from the automatic controls, for cleaning and maintenance of the engine.

3.10 Automatic Change-over System

A fully automatic change-over system must be provided to isolate the mains supply and connect the standby set to the outgoing feeder in case of a mains failure and reverse this procedure on return of the mains.

3.11 By-pass Switch and Main Isolator

The switchboard shall be equipped with an on-load isolator to isolate the mains and a manually operated on-load by-pass switch, which shall either connect the incoming mains to the automatic control gear or directly to the outgoing feeder. In the latter position the automatic control gear, including the main contractors, shall be isolated for maintenance purposes. It shall not be possible to start the engine except with the selector switch in the "TEST" position.

It is required that this by-pass switch and mains isolator be mounted away from the automatic control gear, in a separate compartment either on the side or in the lower portion of the switchboard cubicle, and that the switches operated from the front of the compartment.

3.12 Start Delay

Starting shall be automatic in event of a mains failure. A 0-15 second adjustable start delay timer shall be provided to prevent start-up on power trips or very short interruptions.

3.13 Stop Delay

A stop delay with timer is required for the set, to keep the set on load for an adjustable period of one to sixty seconds after the return of the mains supply, before changing back to the supply. An additional timer shall keep the set running for a further adjustable cooling period of 5 to 10 minutes at no-load before stopping.

4. Installation

Except for the supply of the incoming mains cable and outgoing feeder cables, the tenderer must include for the complete installation and wiring of the plant ready for operation, including the connection of the incoming cable and outgoing feeder cables.

The connecting of the cable and control cabling to the generator and the control terminals in the LV board remains the responsibility of the tenderer.

5. Warning Notices

Notices, in both official languages, must be installed in the plant rooms.

The contents of these notices are summarised below.

(a) Unauthorised entry prohibited.

(b) Unauthorised handing of equipment prohibited.

(c) Procedure in case of electric shock.

(d) Procedure in case of fire.

The successful tenderer must consult the Occupational Health and Safety Act 83 of 1993 and get approval of the wording from the Department's representative, prior to ordering the notices.

Lettering must be black on a yellow background.

Notices (a) must be installed outside next to the entrance of the plant room and (b-d) inside the plant room.

In the plant room, a clearly legible and indelible warning notice must be mounted in a conspicuous position.

The motive shall be made of a non-corrodible and non-deteriorating material, preferable plastic, and must read as follows:

DANGER: This engine will start without notice. Turn selector switch on control board to "OFF" before working on the plant.

GEVAAR: Hierdie masjien sal sonder waarskuwing begin loop. Draai keuseskakelaar op beheerpaneel na "AF" voordat aan die masjien gewerk word.

6. Construction

The engine and alternator of the set shall be built together on a common frame, which must be mounted on a skid base on anti-vibration mountings. The set must be placed direct on the concrete of the generator room. A drip tray must be fitted under the engine. The tray must be large enough to catch a drip from any part of the engine.

The frame must be of the 'DUPLEX' type.

7. Operation

The set is required to supply the lighting and power requirements in the case of a mains power failure.

The set shall be fully automatic i.e. it shall start when any one phase of the main supply fails or get switched and shall shut down when the normal supply is re-established. In addition it shall be possible to manually start and stop the set by means of pushbuttons on the switchboard.

The automatic control shall make provision for three consecutive starting attempts. Thereafter the set must be switched off, and the start failure relay on the switchboard must give a visible and audible indication of the fault.

To prevent the alternator being electrically connected to the mains supply when the mains supply is on and vice versa, a safe and fail proof system of suitably interlocked contactors shall be supplied and fitted to the changeover switchboard.

SPECIFICATION FOR THE SUPPLY DELIVERY AND INSTALLATION OF AN EMERGENCY GENERATOR SET

SECTION 3 –TECHNICAL SPECIFICATION

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SECTION 3 – TECHNICAL SPECIFICATION

1. GENERAL

Supply, deliver, install, commission, and test an emergency generating set.

This installation must comply fully with all the sections and drawings of this document. This technical specification is supplementary to the Equipment Requirements, Section 2, and must be read together. Where they are at variance the Technical Specification shall apply.

The set must be installed in an existing plant room.

SPECIFICATION FOR THE SUPPLY DELIVERY AND INSTALLATION OF AN EMERGENCY GENERATOR SET

SECTION 4 – PARTICULAR SPECIFICATION

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AUTOMATIC STANDBY DIESEL GENERATOR

1. SCOPE OF WORK

1.1 The new skid-mounted diesel generator and associated day tank shall be installed in the same position as the previous unit.

1.2 Reinforced braced galvanised cowling need to be constructed on the inside the plant room. This sheet metal ducting shall accommodate the dummy load element in front of the radiator.

1.3 A separate floor-standing generator change-over panel with 50 A change-over equipment is required.

2. SITE MEASUREMENTS

The dimensions of the existing plant room are ± 7000mm x 8000mm and 4000mm x 4000mm.

The tenderer shall also confirm prior to manufacturing whether the genset position and size of the generator room and access doors are acceptable for the generating set physical and ventilation requirements.

3. STANDARD SPECIFICATION

The generator shall comply with the Department of Public Works Standard Specification for Standby Diesel Generators, obtainable from the DPW, Vermeulen Street, Pretoria.

4. ADVANCE INFORMATION

Full details of the proposed generating set construction and finish, as well as the electrical services and equipment placement shall be submitted to the Project Manager for approval prior to manufacturing. Refer to Section 1.

5. GENERATOR PLANT ROOM

The set can be mounted on a hot dipped galvanized or painted mild steel skid frame. The unit shall have a duplex base and no vibration shall be transferred to the concrete plant room floor.

A new earth point, which is earthed to general earth, must be provided for the generating set. All components of the generating set shall be bonded to ensure that all parts of the generating set are at an equipotential.

6. ALTERNATOR REQUIREMENTS

The emergency power generating set shall be capable of delivering 15 kVA minimum output power at 0, 85 power factor. This rating shall be attainable at its output terminals, at the specified altitude, and in the configuration as specified.

The load consist of a 12kW mixed building-related loads, including gas discharge security lighting.

NOTE:

The set shall be able to accept this load as a single step load within 10 seconds following start-up. This performance requirement shall be used to calculate the size of the prime mover and alternator.

7. SYSTEM OPERATION

The changeover unit, from mains (or normal) to emergency power shall be a separate floor standing DB.

The changeover equipment shall consist of a suitably rated (50 A) Mitsubishi changeover contactor pair, mechanically and electrically interlocked to prevent the paralleling of the mains and emergency supplies. The protection and changeover equipment shall all be rated at 15 kA fault level.

These contactors shall change the supply to the existing, Main Distribution Board Generator power section from mains to emergency power and vice versa in the following manner:

Protection circuit breakers shall be Merlin Gerin.

a) Whilst the mains are healthy, the mains contactor shall be closed.

b) Failure of a phase or failure of the total supply to the main distribution board (normal power), shall be detected on the outgoing side of the mains busbar. A phase failure or a failure of the total supply shall initiate the starting cycle of the genset, after an adjustable 0 to 6 second delay. If the mains supply is restored within the set period, the starting cycle shall be aborted and the control system shall reset to the standby mode.

c) As soon as the emergency supply from the genset becomes available, a timing circuit shall be initiated to provide an adjustable 0 to 6 seconds delay (preferably 3 seconds) between the opening of the mains contactor and the closing of the emergency contactor.

d) Note that the mains contactor shall remain closed during generator start-up and shall not open unless the emergency supply is available and the mains supply is still out.

e) As soon as the mains supply is restored, a mains return timing circuit shall be initiated to hold the mains contactor open and the emergency contactor closed, for an adjustable period of 0 to 10 minutes (preferably 10 minutes). This is required to prevent the changeover from emergency to mains taking place if the restoration of the main supply is only temporary.

f) At the end of this mains return delay, the emergency contactor shall open and the main contactor shall close. An adjustable delay of 0 to 3 seconds shall be provided between the opening of the emergency and closing of the mains contactors.

g) After successful reverse changeover back to mains supply, the engine shall be run on no-load for a pre-set period. A 0 to 6 minute adjustable timer shall control this period.

h) At the end of the run down period, the engine shall be shut down and the control system shall revert to the standby mode.

i) Should a main failure re-occur during the run down period, the run down cycle shall be aborted and the changeover from mains to emergency shall take place as before.

8. CONTROL FACILITIES

8.1 Two key operated switches, labelled as follows, shall be fitted on the generator control panel, located at the generator:

(a) *GEN AUTO START* — This switch shall have 2 positions. In the *Auto Start* position, the changeover sequence shall operate automatically as described. In the *Gen. Locked Out* position, the changeover sequence shall not be initiated if a mains fail situation occurs. Remote alarm indication (on the control panel) is required if the switch is in the latter position.

(b) *SIMULATE MAINS FAIL* — This switch shall have 2 positions. In the *Simulate* position, a main failure shall be simulated. In the *Normal* position, the system is set to the normal auto standby mode.

(c) *MANUAL START & STOP*

8.2 Auxiliary supplies for the change over control circuiting must be supplied from the 24 V generator batteries.

8.3 A system schematic diagram (A2 size), indicating the phase failure sensing circuit and the generator change over and control circuit, shall be prepared and mounted on the main switch room wall behind 4 mm clear Perspex.

8.4 Statutory warning notices shall be installed inside the plant room and on the entrance doors.

8.5 The following pilot lights, with a lamp test facility, shall be provided on the generator control panel:

- Load on normal supply : Green
- Load on emergency supply : Blue
- Mains failure : Amber
- Engine run down cycle : Blue
- Genset in standby mode : Green
- Water jacket heater failure : Amber
- Low fuel level : Amber
- Engine start failure : Red
- Auto-start disabled : Red
- High engine temperature : Red
- Battery charger failure : Red

- Engine overspeed : Amber
- Engine underspeed : Amber
- Overvoltage : Amber
- Undervoltage : Amber

8.6 Critical alarms will shut the engine down. The critical (red) and non-critical (amber) alarms shall be wired in series. These two circuits shall each energise a relay in the normal mode. A 40 W 24 V siren and 24 V xenon strobe shall be mounted above the doors outside the plant room. These shall be activated in case of an alarm condition (critical and non critical). Each of these relays shall be employed to provide the "generator critical" and "generator fault" alarms on the remote alarm panel.

8.7 Provision will be made to connect an alarm annunciator panel to voltage free contacts for each of the above alarms.

8.8 All timer relays shall be labelled according to their function, for ease of maintenance and future modifications, e.g.

- "Engine run down : Timer T7"; or
- "Mains return delay : Timer T5".

8.9 All sensors and timers shall be of the Rhomberg Slimline plug-in type, control relays shall be Omron.

9. ELECTRONIC GOVERNOR

An electronic governor, Woodward or Cummins or approved equivalent, must be supplied and installed to ensure fast step response recovery and accurate speed control of the diesel engine under varying load conditions to render the set compatible with electronic starter circuitry input tolerances.

10. DAY FUEL TANK

10.1 A new day tank of 200 litre capacity shall be manufactured, supplied and installed in the generator plant room. The fuel tank shall be positioned such that free access to the tank may be afforded.

10.2 The fuel tank shall be fitted with an alarm to provide an audible alarm on the generator control panel when the fuel level in the tank drops below 75 litres.

10.3 A fuel level indicator shall be mounted on the tank in a position which is visible when operating the fuel pump. The indicator shall be a full height transparent gauge tube. The tube shall not be manufactured from glass or plastic. The lower gauge tube connection shall be fitted with a shut-off valve.

10.4 A stopcock shall be fitted on the lowest point of the day tank to withdraw fuel samples.

10.5 A mechanical fusible link across the diesel engine will provide fuel shut-off in case of fire. The daytank outlet shall be fitted with a 16 mm brass ball valve and 8 kg gravity dead-weight to facilitate the shut-off.

10.6 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 accessories. The drip tray shall be

manufactured from black mild steel. The thickness of the drip tray sheet steel shall not be less than 2mm.

11. BULK FUEL TANK

11.1 A bulk fuel tank of 2 250 litre (minimum) capacity shall be manufactured, supplied and installed in an approved position in close proximity of the plant room. The tank shall be installed above ground level on hot dipped galvanized stand on concrete footings. The tank installation shall conform to SANS 10131 Part 2 and 3 as amended.

11.2 The filter cap shall allow dipstick measure access and the neck connection shall be compatible with fuel delivery truck hose connections.

11.3 Gravity feed lines shall be 22 mm ø copper tubing with galvanised support brackets and galvanised protective unistrut sections between the bulk and day tanks. Underground piping shall be steel to SANS 62 with allowance for expansion, wrapped with Denso tape, overlapping 15 mm.

11.4 The day tank level switch shall switch the 24 VDC solenoid valve at the day tank inlet to initiate gravity feed.

11.5 Level switches shall be REMEX or approved equivalent.

Note that a total of three level switches are required:

- empty tank engine cut-out signal.
- low fuel alarm
- switching the inlet solenoid valve

11.6 The day tank will be fitted with a 32 mm overflow outlet piped to the bulk tank with similar size return line.

11.7 An insulated 16 mm² earth wire shall be provided to bond the bulk tank to the generator day tank.

11.8 The fuel line will be provided with a high capacity water separator and 5 micron fuel filter with replaceable filter cartridges.

11.9 The fuel line layout shall conform to schematic drawing attached.

11.10 The bulk fuel tank shall be fitted with a 25 mm hose with a manual operated pump.

12. EXHAUST SYSTEM

12.1 The exhaust system of the generator shall be designed to operate below 65 dbA sound level measured 1 m from the exhaust outlet. The section outside of the room shall be manufactured from 316 stainless steel.

12.2 The entire section of the exhaust in the container shall be lagged with heat insulating material so that the cold surface temperatures do not operate at more than 60° C above ambient.

12.3 The exhaust shall face away from the existing buildings. The exhaust shall be fitted with a drain tap at the lowest point of the exhaust, to allow the draining of water entering the pipe. The exhaust shall be supported by means of a structure supplied and installed as part of this contract.

13. GENERATING SET COLOUR

The base frame, tank, diesel engine and alternator shall be provided in the manufacturers' standard colours.

14. BATTERIES

The diesel generator set 24 V starting batteries shall be Delco Remy Type 1250. Batteries shall be supplied complete with mains trickle charger and battery stand as specified. The charger shall be internally supplied from emergency power while the set is operational, (i.e. mains not available). The charger shall be capable to recharge a fully discharged battery under normal operating modes from the mains supply.

15. WATER JACKET HEATER

An electrical type water jacket heater system shall be provided, complete with thermostat, in accordance with the Standard Technical Specifications.

16. DUMMY LOAD

A 3 step dummy load must be supplied and installed. Dummy load shall constitute 70 % of the rated generator output. The load monitoring circuit shall select the load in any of three steps, 30 %, 20 % and 20 %. Bypass selector switches and indicators must also be provided to enable the manual selection of any of the three step loads.

The dummy load will only be connected 5 minutes after start-up. Three amber indicators (one per bank) labelled "bank n connected" shall be provided. Preference shall be given to generator systems where the dummy load is an integral part of the radiator cowl and is cooled by the radiator fan.

17. GAUGES

All gauges, i.e. water temperature, oil pressure, battery voltage, battery charge rate and frequency, 3-phase demand current, voltage selector switch and meter shall be provided with engraved labels, indicating the "normal" parameters of each gauge. The exact information to be engraved shall be determined upon commissioning of the installation. Where practical the gauges shall be mounted on the generator control panel.

18. ELECTRIC FUEL PUMP

A one *litre* per second indoor electric fuel pump must be provided at the generator to enable the bulk fuel tank to be filled from any outside fuel source.

The electric pump shall be fed from the generator control panel with emergency power. The pump shall be activated by means of pushbutton "push to operate" control. This pushbutton shall be installed on the wall within sight of the fuel tank visual level indicator.

The electric pump shall be fitted with a 25 mm ø 10 m fuel compatible suction hose. A cartridge type fuel filter shall be provided between the above-mentioned electric pump and the tank.

19. HOUR METER

A six-digit hour meter shall be installed on the control panel.

20. DRIP TRAY

A removable drip tray shall be supplied inside the skid frame to collect spillage from the fuel pump and diesel engine.

21. FIRE EXTINGUISHERS

One 9 kg fire extinguisher suitable for extinguishing electrical and fuel fires shall be supplied and mounted inside of the generator room.

22. CABLING

Interconnecting cable shall be protected on the floor by means of an inverted 300 mm heavy duty cable tray fastened onto the floor.

23. COMMISSIONING AND TESTING OF THE GENERATOR SET

23.1 Testing

Before delivery to site, the Project Manager or his representative shall be invited to witness tests at the manufacturer's premises. Test shall be carried out in accordance with BS 5514, to prove that the equipment will deliver the specified output. The manufacturer shall submit a proposed detail test procedure to the Project Manager at least two weeks before testing.

Suitable test gear shall be provided at the manufacturer's premises in order to simulate and prove all aspects of the changeover system as specified.

All protective devices and systems shall be fully tested. Injection tests shall be performed to check and test all metering equipment.

The making available of all equipment, plant and instruments required for the testing and commissioning shall form part of this contract.

On site, tests shall be a repetition of the above and shall also be performed in the presence of the Project Manager or his representative. The contractor shall provide all the test equipment and instruments which may be necessary. Load tests are to be done on both occasions.

Copies of the test reports for the above tests shall be submitted to the Project Manager, and shall also be included in the Maintenance Manuals.

23.2 Commissioning

All items shall be pre-checked by the contractor, prior to commissioning. Copies of the results of all pre-checks, as well as a detailed commissioning procedure for each piece

of equipment, shall be presented to the Project Manager for approval *before* commissioning takes place. Note that the Project Manager will not commission the system or any part thereof on behalf of the contractor. The contractor, to the satisfaction of the Project Manager shall perform all commissioning. The Project Manager will witness commissioning.

24. MAINTENANCE AND OPERATING MANUALS

The contractor shall prepare and provide comprehensive maintenance and operating manuals (three sets of each) for the genset in its entirety, in accordance with the standard specifications and comprising the following:

24.1 Pre-start Checks

These checking procedures shall include pre-start-up checks on batteries, fuel pipes, fuel levels, lubrication oil levels, coolant levels, alarm indicator lamps and settings of key operated switches and timer relays.

24.2 Operating Instructions

The function of each switch or control device shall be detailed.

Manual or automatic operation settings and procedures shall be detailed.

24.3 Alarm Indication

All alarm conditions and remedies to restore these conditions shall be detailed.

24.4 Fault Finding

Detailed, logical fault finding procedures, together with readings to be expected for all possible fault conditions, shall be detailed.

24.5 Wiring Diagrams

Detailed wiring diagrams complete with cable wire and core numbering as well as terminal block and relay numbering shall be provided.

24.6 Engine and Alternator Information

Relevant detail regarding engine and alternator specifications, lubricants required, recommended service intervals, detailed service procedures, spares lists and dealer network information shall be provided.

24.7 Electronic Starter Information

Detailed service and calibration procedures as well as a schedule of consumable spares shall be provided.

24.8 Test Sheets and Certificates

Copies of all works test sheets and type test certificates for all items shall be provided.

The contractor's attention is drawn to the following:

(a) A draft Operating and Maintenance Manual shall be submitted to the Project Manager for approval at least 3 weeks *before* the anticipated handing over date.

(b) The contract will not be regarded as complete until all requirements in this regard have been met.

25. TRAINING OF AN OPERATOR

After the installation has been commissioned, the contractor shall train an appointed person to operate and control the generating set. The cost of training shall be included in the tender price. The training procedures shall be submitted to the Project Manager in writing. After completion of the training period, the Project Manager will evaluate the trainee.

26. HANDING OVER

The Contractor on handover of the completed works shall provide a full tank of diesel for the generator to the project manager.

TECHNICAL SPECIFICATION

HC LOW VOLTAGE RETICULATION

CONTENTS

HC 01 SCOPE

HC 01.01 This specification comprises all aspects regarding the repair and maintenance of low voltage systems. Low voltage comprises:

- low voltage distribution boards
- low voltage kiosks
- low voltage overhead distribution system

HC 01.02 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 Specification included with this document.

HC 02 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

HC 02.01 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 the specification and shall deemed to form part thereof.

HC 02.02 **SANS Specifications**

- SANS 10142-1
- SANS 10142-2
- SANS 141
- SANS 1091
- SANS 121
- SANS 1195
- SANS 784

HC 02.03 **Department of Public Works Specifications**

- PW 774

HC 02.04 **Occupational Health and Safety Act of 1993 (OHS-Act)**
HC 02.05 **Manufacturer's specifications and maintenance instructions**

HC 02.06 **Additional requirements**

Equipment and material installed shall be new and unused.
All equipment shall bear the SANS 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.

HC 03 AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS

HC 03.01 **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 information.

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

HC 03.02 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:

- System Description
  - Completed 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.
  - Completed details of L.V distribution boards, panels and kiosks and overhead reticulation system.
- Commissioning Data
  - Completed commissioning, test and inspection data of the low voltage system.

    This shall be done for each low voltage system individually. The commissioning data will comprise of usual inspection sheets startup and running current measurements. Full data on equipment fitted with installation dates.
- Operating data
  - Safety precautions to be implemented.

- Maintenance instructions

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

HC 04 TEST AND INSPECTION FOLLOWING COMPLETION OF REPAIR WORK

HC 04.01 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 hours notice to the Engineer prior to the test date.

HC 05 LOGGING AND RECORDING PROCEDURES

HC 05.01 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.

HC 05.02 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.

HC 06 MAINTENANCE TOOLS AND SPARES

HC 06.01 On commencement of the Repair and Maintenance Contract, the Contractor shall compile an inventory of the existing Tools and Spares in the presence of the User Client. Any deficiencies or short fall or damaged Tools and Spares shall be replaced with new equipment / material, as part of the contract.

HC 06.02 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 short fall shall be replaced by the Contractor as part of his responsibility under this contract.

HC 06.03 **The Tools and Spares shall at least include the following:**

DB Key
DB face plate square key.

HC 07 QUALITY ASSURANCE SYSTEM

HC 07.01 Following formal approval of his Quality Assurance system by the Engineer, the Contractor shall implement the approved QA system.

HC 07.02 Records of this QA system shall be kept throughout the duration of the contract and shall be submitted to the Engineer as required.

HC 08 RE-COMMISSIONING OF INSTALLATION

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

HC 09 REPAIR WORK TO LOW VOLTAGE RETICULATION

HC 09.01 The distribution boards, kiosks and overhead reticulation system shall be repaired as measured in the bills of quantities, during the first period of the repair and maintenance contract.

HC 09.02 The scope of the repair work shall include, but shall not be limited to the activities listed below.

HC 09.03 The Contractor shall record the repair actions in tabular format before the maintenance phase commences.

HC 09.04 Repair work shall be executed within the approved period for repairs. This period shall be agreed at the start of the contract period.

HC 09.05 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.

HC 09.06 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.

HC 10 LOW VOLTAGE RETICULATION MAINTENANCE

HC 10.01 The various low voltage systems shall be maintained following the initial repair work. The maintenance contract shall run for the balance of the 36 month contract period.

HC 11 LOW VOLTAGE DISTRIBUTION BOARDS: TECHNICAL DETAILS

HC 11.01 **Installation description**

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

Substations

The low voltage supply is distributed from the low voltage room in substation.

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

HC 11.02 **Scope of repair work**

HC 11.02.01 **General repair work**

- Service low voltage distribution boards: clean, secure circuit breakers, secure terminations, label circuit breakers and cables.
- Move circuit breakers: Loosen circuit breakers move and secure in new position.
- Install circuit breaker.
- Re-paint front cover of emergency section.
- Disconnect and remove redundant switchgear.
- Replace circuit breakers.
- Disconnect and remove redundant street and security lighting control panel.
- Disconnect and remove redundant cables.
- Replacement of undersized jumper cables.
- Installation of trench covers.

HC 11.03 **Repair work: measurement and payment**

Item		Unit
(a)	Service low voltage distribution boards	No

The unit of measure 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.

Item		Unit
(b)	Test ammeter and CT functionality.	No.

The unit of measure 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.

Item		Unit
(c)	Re-paint cover on panel	No.

The unit of measure 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.

	Item	Unit
(d)	Remove redundant cable	No

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

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

	Item	Unit
(e)	Supply and install power outlets.	No

The unit of measure shall be the number of power sockets installed.

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

	Item	Unit
(f)	Supply and install light switch.	No.

The unit of measure 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.

	Item	Unit
(g)	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 18mm. The marking system used should be of type Graftoplast or equal.

	Item	Unit
(h)	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.

	Item	Unit
(i)	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 supply and installation and connection of circuit breakers as specified.

HC 11.04 **Scope of Maintenance work**

HC 11.04.01 **Monthly inspection**

a) Verify operation of volt and ammeters.

b) Check that access covers are secure.

c) Visually check distribution board.

d) Check all connections.

e) Check operation of switching timers.

HC 11.04.02 **Annual inspection**

a) Service all low voltage boards.

b) Measure phase voltages and line currents in low voltage distribution board.

c) Record values in record book.

HC 11.05 **Maintenance work: measurement and payment**

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

HC 12 DISTRIBUTION AND METERING KIOSKS: TECHNICAL DETAILS

HC 12.01 **Installation description**

This section describes the electrical distribution and metering kiosks that will be repaired and 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.

HC 12.02 **Scope of repair work**

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

2) Measure earth resistance.

3) Touch up kiosks: Remove all rust with an anti corrosion agent and repaint kiosks.

4) Replace handles and padlocks on distribution kiosks.

5) Remove and re-mount contactors

6) Replace door hinges and latches

7) Replace panel catches

8) Repair burnt connections

HC 12.03 **Repair work: measurement and payments.**

Item	Unit
(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 the kiosk (damage, rust etc.)

	Item	Unit
(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 a anti corrosion agent and the repainting of the whole kiosk.

	Item	Unit
(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 the warning notification to be installed.

	Item	Unit
(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".

	Item	Unit
(e)	Replace distribution meter and stubby kiosks.	No.

The unit of measurement 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.

	Item	Unit
(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.

	Item	Unit
(g)	Supply and install handles. (Perano type lockable turn catch door handle (heavy duty)	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 and ordering, supply and installation of a lockable turn catch handle.

	Item	Unit
(h)	Supply and install low voltage PVC/SWA/PVC Cu cable and bare copper earth wire.	No.

The unit of measurement 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.)

	Item	Unit
(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.

	Item	Unit
(j)	Jointing of low voltage PVC/SWA/PVC Cu cable.	No.

The unit of measurement shall be the total number of joints made.

The tendered rate shall include full compensation for the supply and installation of all material needed to complete the joints.

	Item	Unit
(k)	Excavations for cable trenches and meter boxes.	m^3

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

	Item	Unit
(l)	Supply and installation bare copper earth conductor.	meter

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).

	Item	Unit
(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.

	Item	Unit
(n)	Re-wiring of kiosk.	No

The unit of measure shall be 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.

	Item	Unit
(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.

	Item	Unit
(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.

HC 12.04 **Maintenance Work**

HC 12.04.01 **Monthly**

a) Inspect and secure access doors and covers.

b) Inspect distribution kiosks.

HC 12.04.02 **Annually**

a) Service all distribution and metering kiosks.

b) Measure phase voltages and line currents in distribution and metering kiosks and record in book.

HC 12.05 **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 (Installation F).

HC 13 LOW VOLTAGE OVERHEAD DISTRIBUTION SYSTEM: TECHNICAL DETAILS

HC 13.01 **Installation description**

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

This part of the distribution network consists of wooden poles, bare low voltage overhead conductors in a horizontal system configuration with cable connections to houses.

HC 13.02 **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 1m distance from conductors.

(d) Replacement of rusted distribution boards

HC 13.03 **Repair work: measurement and payments.**

	Item	Unit
(a)	Service overhead distribution system	meter

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.

	Item	Unit
(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.

	Item	Unit
(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.

	Item	Unit
(d)	Replacement of wooden pole	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 and plant of new pole, backfilling and compaction, re-installation of suspension assemblies and connection of conductors and re-tensioning of conductors if required.

	Item	Unit
(e)	Replacement of overhead house connection	No.

The unit of measurement shall be the number of house connections replaced.

The tendered rate shall include full compensation for isolation of overhead conductors, disconnection and removal of existing overhead house connection, excavation for new cable connection, supply and installation of 16 mm² 3 core Cu cable including all connections to existing meter and overhead supply line and backfilling of trench.

	Item	Unit
(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 new board as per specification excluding equipment.

	Item	Unit
(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 breaker with rating as specified, installation of breaker in distribution board and connection of breaker.

HC 13.04 **Maintenance Work**

HC 13.04.01 **Monthly**

a) Inspect overhead conductors, insulators and poles.

HC 13.04.02 **Annually**

a) Service overhead distribution system.

b) Measure phase voltages and line currents and record in book.

TECHNICAL SPECIFICATION

HE EXTERIOR LIGHTING SYSTEMS

CONTENTS

HE 01 SCOPE

HE 01.01 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

HE 01.02 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.

HE 02 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

HE 02.01 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.

HE 02.02 **SANS Specifications**

02.02.01	SANS 10400	National Building Regulations
02.02.02	SANS 10142	Wiring code
02.02.03	SANS 10225	Lighting masts
02.02.04	SANS 1277	Read lighting luminaires
02.02.05	SANS 1088	Spigot entries
02.02.06	SANS 1749	Glass-reinforced polyester (GRP) poles
02.02.07	SANS 1250	Capacitors, ballasts & lamps
02.02.08	SANS 1279	Floodlight luminaires
02.02.09	SANS 1777	Photoelectric control units for lighting (PECUs)
02.02.10	SANS 763	Galvanised coatings
02.02.11	SANS 1266	Discharge lamps
02.02.12	ARP 035	Streetlighting maintenance

HE 02.03 **Department of Public Works Specification PW 774**

HE 02.04 **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.**

HE 02.05 **Manufacturer's specifications and installation instructions**

HE 02.06 **Additional requirements**

Equipment and material supplied and installed shall be new and unused.
Luminaires and control gear shall bear the SANS 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.

HE 03 OPERATING AND MAINTENANCE MANUALS

HE 03.01 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 seven sets of hard copies.

HE 03.02 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:

03.02.01 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, 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.

03.02.02 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.

03.02.03 Operating data

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

03.02.04 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 manufacturer's brochures / pamphlets, order number, list of components and lamp specification.
f) Schedule of serviceable components per lighting system. These schedules shall include lamps, starters, igniters, ballasts, lenses, etc.

HE 04 TESTS AND INSPECTIONS PRIOR TO PRACTICAL COMPLETION OF REPAIR WORK

HE 04.01 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:

04.01.01 Phase voltages
04.01.02 Current per phase
04.01.03 Illumination levels in lux
04.01.04 Insulation testing at 500V
04.01.05 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.

HE 05 LOGGING AND RECORDING PROCEDURES

HE 05.01 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.

HE 05.02 The logbook shall be stored in a safe place inside the maintenance supervisor's office 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:

05.02.01 Monthly lamp inspection and maintenance actions.
05.02.02 Bi-annual inspection and testing of lighting systems.
05.02.03 Annual earthing test report.
05.02.04 Breakdown / call out reports.

HE 06 QUALITY ASSURANCE SYSTEM

HE 06.01 Following formal approval of his Quality Assurance system by the Engineer, the Contractor shall implement the approved QA system.

HE 06.02 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.

HE 07 RE-COMMISSIONING OF INSTALLATION

HE 07.01 On practical completion of the repair work and lamp replacement, the lighting installations shall be put into operation.

HE 07.02 Lighting 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

HE 08 REPAIR WORK TO EXTERIOR LIGHTING INSTALLATIONS

HE 08.01 The various lighting systems shall be repaired as part of installation H during the first phase of the repair and maintenance contract

HE 08.02 The scope of the repair work shall include, but shall not be limited to the activities listed below.

HE 08.03 The Contractor shall record the repair actions in tabular format before the Contractor's responsibility for maintenance commences.

HE 08.04 Repair work shall be executed within the approved period for repairs.

HE 08.05 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.

HE 08.06 The following measurement and payment items shall apply for repair work

	Item	Unit
HE 08.06(a)	**Excavate in all materials for trenches, backfill, compact and dispose of surplus material**	m^3

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.

	Item	Unit
HE 08.06(b)	**Extra over item HE 09.06(a) for excavating in hard material**	**m^3**

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 HD 09.06(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 0,15 m^3 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.

	Item	Unit
HE 08.06(c)	**Extra over item 3.10.1.1 for excavating by hand in all materials**	m^3

The unit of measurement shall be the cubic metre of trench material excavated by means of hand tools as instructed or authorised in writing by the Engineer where the use of 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 HE09.06 (a).1in full compensation for the additional expense of excavating by means of hand labour instead of conventional trenching equipment.

	Item	Unit
HE 08.06(d)	**Extra over item HD09.06 (a) for using backfill material obtained from sources provided by the Contractor**	m^3

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

Item HD09.06 (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.

The tendered rate for item HE09.06 (d) paid extra over item HE09.06 (a) shall cover the cost of the acquisition of the material and of the disposal of the surplus material resulting from the importation together with all the costs of transporting the material to the site regardless of distance.

	Item	Unit
HE 08.06(e)	**Supply and Install Cable Sleeves**	m

The unit of measurement shall be the linear length in meter 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
HE 08.06(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
HE 08.06(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
HE 08.06(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.

	Item	Unit
HE 08.06 (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, shrouds and lugs, the cost of handling, fitting and cutting the cable. Separate items shall be scheduled for each size and type of cable.

	Item	Unit
HE 08.06(j)	**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.

	Item	Unit
HE 08.06(k)	**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.

	Item	Unit
HE 08.06(l)	**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.

	Item	Unit
HE 08.06(m)	**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.

	Item	Unit
HE 08.06(n)	**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.

	Item	Unit
HE 08.06(o)	**Supply and installation of internal luminaire components**	No

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.

	Item	Unit
HE 08.06(p)	**Internal wiring of luminaire**	No

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.

	Item	Unit
HE 08.06(q)	**Supply and install 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 circuit breakers where the circuit breakers are specified separately.

	Item	Unit
HE 08.06(r)	**Supply and install 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 isolators where the isolators are specified separately.

	Item	Unit
HE 08.06(s)	**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 contactors where the contactors are specified separately.

	Item	Unit
HE 08.06(t)	**Supply and install of low tension 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 fuses where the fuses are specified separately.

	Item	Unit
HE 08.06(u)	**Supply and install National photocell (plug-in type)**	No

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

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

	Item	Unit
HE 08.06(v)	**Supply and install Heinemann QAT-R-Clip in timer**	No

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

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

	Item	Unit
HE 08.06(w)	**Supply and install 0-30A HRC 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 installing of the fuses where the circuit breakers are specified separately.

	Item	Unit
HE 08.06(x)	**Supply and install end connectors and insulating sleeves**	No

The unit of measurement shall be the number of end connectors and insulating sleeves supplied and installed.

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.

The end connectors shall be similar or equal to Pratley No 2 end connectors and insulating sleeves.

	Item	Unit
HE 08.06 (y)	**Replace pole**	

The unit of measure shall be the number of 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 and installation of the pole in the position specified.

The contractor shall install all existing equipment onto the new pole

	Item	Unit
HE 08.06 (z)	**Replace Luminaire diffuser**	

The unit of measure shall be the number of luminaire diffusers replaced.

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

	Item	Unit
HE 08.06 (aa)	**Replace pole mounted brackets**	

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

The tendered rate shall include full compensation for the ordering, supply and installation of the pole bracket including all fixing accessories as specified according to manufactures instructions.

The tendered rate shall further include for the removal of all old equipment from the pole and the supply and installation of the new equipment onto the pole bracket including the connection of the equipment.

	Item	Unit
HE 08.06 (ab)	**Replace pole cover**	

The unit of measure 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 and installation of the new pole cover as specified according to manufactures instructions.

	Item	Unit
HE 08.06(ac)	**Junction boxes including pole mount brackets.**	No.

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

The tendered rate shall include full compensation for the supply and installation of junction boxes 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 terminals and circuit breakers.

	Item	Unit
HE 08.06(ad)	**Remove rust and paint kiosks**	

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 a anti corrosion agent and the repainting of the whole kiosk.

	Item	Unit
HE 08.06(ae)	**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 the warning notification to be installed.

	Item	Unit
HE 08.06(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.

Lock shall be "keyed alike".

	Item	Unit
HE 08.06(ag)	**Replace distribution meter kiosks.**	No.

The unit of measurement 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 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.

Consumer distribution kiosks

(a) General

The kiosks shall be of adequate size to accommodate the number of outgoing consumer circuits specified.

The kiosks shall have two sections, namely:

(i) One section containing all incoming and outgoing switchgear and cables, and

(ii) One section containing the consumer meters and circuit breakers.

(b) Fabrication

The kiosks shall be fabricated from 3CR12 stainless steel of minimum thickness 2,5 mm and shall be mounted on a channel iron steel base.

A metal frame work, manufactured from solid angle iron, channel iron, or 2,5 mm 3CR12 folded sheet steel shall be mounted on the base of the kiosk. The kiosk shell shall be completely independent from the frame and equipment so that the kiosk shell can be removed and replaced without disconnecting any equipment. The kiosk shall be bolted down onto the base by means of four M16 high tensile bolts which shall be accessible from the inside of the kiosk only.

The kiosks shall be weatherproof, vermin and insect-proof and proved against tampering. To prevent the ingress of water onto live equipment, the door entry surrounds shall have a channel shape, at least 12 mm deep, to accommodate the door edge. A rubber or neoprene closer strip shall be so fitted to the edges of each door as to provide a seal to keep rain water and dust out of the kiosk.

The kiosk shall have a pitched roof that slopes downwards at the front and at the back with an overhang of at least 75 mm all round.

The kiosks shall be fitted with a door in the front and at the back of the kiosk. The maximum width per door shall be 600 mm. The doors shall provide free access to the equipment and shall provide a full view of all meters. The doors shall have well returning edges to fit into the channel of the door entry surrounds. Each door shall have three robust solid brass hinges each of length at least 100 mm. The hinges shall be completely concealed. Doors shall be fitted with lever locks equal or similar to the "Barker & Nelson" type. The locking mechanism shall facilitate three point latching at the top, side and bottom of the doors. In the case of double doors the first door shall be locked with two slides on the inside onto the kiosk shell. The second door shall close over a lip on the first one. Nylon door restraints shall be provided. The fixing points of the restraints at the door and the canopy shall be reinforced. The doors shall be earthed bonded to the frame by means of a copper braided strap, tooth washers, bolts and nuts.

Ventilation louvers with approximate size 225 x 150 mm shall be provided on both sides of the kiosk. Each ventilation louver shall be covered on the inside with perforated plates with 2,5 mm^2 holes so that

- It is not possible to push a steel wire through it into the interior of the kiosk, and
- It prevents vermin from entering into the kiosk.

A mounting panel shall be positioned in the centre of each kiosk, fixed to the frame work, for the mounting of the specified equipment.

(c) Mounting panel

The mounting panel shall consist of a minimum 3 mm thick mild steel plate.

The one section of the panel shall be equipped with copper busbars mounted on porcelain or similar insulators and of sufficient length to accommodate three 12 mm brass bolts for the connection of distribution cables and six consumer meter connections per phase. The busbars shall be tinned after the drilling of holes. The busbars shall be able to carry 250 Ampere at a current density of not more then 1,5 A/mm^2. Each busbar shall be marked red, yellow and blue with black for the neutral bar. The busbars shall be able to withstand the thermal and dynamic forces resulting from short circuits without deformation taking place or parts breaking.

The specified consumer equipment shall be installed in the second section. The mounting panel and equipment shall be enclosed by a machine punched removable front panel through which the operating handles of the equipment and the face plates of the meters protrude.

(d) Equipment installed in kiosks

The equipment to be installed in the kiosks shall be as specified in the detail specification.

(e) Wiring of kiosks

The internal wiring in the kiosks shall be done with PVC insulated copper conductors. The wiring shall be done in neat horizontal and vertical columns. Each consumer circuit shall be wired from the phase busbars to the circuit breaker and from the circuit breaker to the meter.

Connections to busbars and terminals shall be done by means of cable lugs crimped in an approved manner to the conductor ends. Connections to the busbars shall be made by means of cadmium plated high tensile steel bolts and nuts with locking washers.

(f) Earthing

A 25 mm x 6 mm long tinned copper earth bar shall be installed at the bottom of the kiosk.

10 mm diameter holes shall be drilled through the earth bar to provide for the distribution cable and service cable earth conductors. All bolts used for the fixing of the earth conductors shall be cadmium plated and only one earth conductor shall be connected per bolt.

The metal work of the kiosk shall be earthed to the earth bar by means of a 70 mm^2 stranded copper conductor. An earth stud shall be provided on the kiosk housing for this purpose.

(g) Cable gland plate

The cables shall be terminated on a removable galvanised gland plate of suitable dimension and strength. The gland plate shall cover the full length of the kiosk.

The gland plate shall be at least 300 mm below the nearest terminal of switchgear allowing sufficient space for bending the cable ends. Sufficient space shall be provided underneath the gland plate to allow for the installation of the cables without removing the gland plate. The gland plate shall be earthed to the earthbar by means of a 70 mm^2 stranded copper earth conductor.

(h) Terminal blocks

A terminal block of the "Klippon SAK" or equivalent type suitable for the termination of 16 mm^2 stranded copper conductors shall be provided. Terminals shall be of the screw type and a terminal shall be provided for each service connection cable.

(i) Labels

The kiosks shall be supplied with the following labels:

(i) An aluminium label with 40 mm high letters and numeral indicating the kiosk number.

(ii) Engraved trafolite labels with 6 mm high numerals under each circuit breaker, meter, and terminal on the terminal block indicating the consumer stand number.

The labels shall have a white background and black letters. The 40 mm labels shall be fixed by means of rivets and the 6 mm high labels shall be inserted in 25 mm wide aluminium label holder mounted at the bottom of the relevant equipment.

(j) Danger signs

The requirements of Regulation C-52 of the Machinery and Occupational Safety Act No 6 of 1983 shall be complied with. All doors shall be fitted with a 150 x 100 mm Danger/Gevaar/Ingozi signs.

(k) Painting and finishing

(i) Post-weld cleaning and passivation of 3CR12

Post-weld cleaning shall be undertaken on all welded areas. One of the following cleaning methods may be used to remove all surface discolouration and scale from welded areas.

(1) Wire brushing: Where it is possible to remove the discolouration and detritus from weld areas by brushing, stainless steel wire brushes that have not been used on other material other than 3CR12 may be used.

(2) Grinding: Dedicated grinding wheels and discs based on alumina shall be used for the dressing of welds. The use of silicon carbide wheels and discs shall not be used.

(3) Abrasive blast cleaning: The abrasive used shall be washed silica sand or alumina totally free of metallic iron, iron oxides or chlorides.

(ii) Chemical cleaning (pickling)

The pickling of 3CR12 shall be carried out using formulations based on nitric (HNO_3) and hydrofluoric (HF) acid. Formulations based on hydrochloric acids shall not be used. Acids used shall conform to commercial purity standards. Where proprietary pickling formulations are used, the manufacturer's directions concerning the application procedures shall be strictly adhered to.

(iii) Passivation

The passivation of the 3CR12 shall be carried out as soon as possible after the post-weld cleaning has taken place. A solution made up of nitric acid shall be used for the passivation of the 3CR12. The solution shall be generously applied to the steel by brush, cloth, spray or dipping. Care shall be taken that the solution does not dry on the steel surface. The steel shall be thoroughly washed with clean cold water to remove all traces of the acid use.

(iv) General

The entire process of cleaning, pickling, passivation and neutralization shall be completed in one working day.

Tenderers shall submit full details of the post weld process their suppliers intend to use.

(v) Painting

All interior metal work shall be thoroughly derusted and degreased and shall be prepared for painting in accordance with SANS 10066.

Immediately after cleaning a zinc chromate red oxide primer with a dry film thickness of 25 micrometre shall be applied in accordance with SANS 679. An intermediate enamel coat shall be applied to the primed surface and thereafter the finishing coat of white enamel paint shall be applied to the interior and "light stone", colour C37 SANS 1091 to the exterior.

The bases and under sides must be treated in an approved manner and finished with two coats epoxy-tar paint.

(l) Drawings and information

Tenderers shall submit full details of the cubicles offered with the following drawings with the tender

- A drawing indicating all dimensions of the kiosks
- A drawing indicating the dimensions of the plinth with fixing arrangements
- A drawing indicating the general internal equipment layout of the kiosks.

The successful tenderer shall, before the manufacturing of the kiosks commences, submit the final drawings to the Engineer for approval.

A schematic wiring diagram of the kiosk, as wired and colour coded, shall be submitted at the completion of the contract.

(m) Inspection

The successful tenderer shall allow the representative of the Engineer access to the manufacturer's works at all reasonable times to inspect the progress of the work and to witness all tests

Item		Unit
HE 08.06(ah)	**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.

Item		Unit
HE 08.06(ai)	**Supply and install handles.** (Perano type lockable turn catch door handle (heavy duty)	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 and ordering, supply and installation of a lockable turn catch handle.

HE 09 AREA LIGHTING: TECHNICAL DETAILS

HE 09.01 Installation description

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

Luminaries are suspended on fibreglass and creosote poles of various lengths. Area lights are controlled by means of photocells and manual on/off switches.

HE 09.02 Scope of repair work

Open each pole cover and inspect fuse or circuit breaker, tray and shield plate as well as earthing connection. Check and replace cover seal if required.

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.

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.

Service luminaires by washing with detergent and re-lamping where necessary. Clean lenses. Check condition of seals and glands and test for earth continuity.

Check consistency of aiming angles and tighten mounting bracket bolts

HE 09.03 Repair work: Measurement and payment

Item		Unit
(a)	**Relamp 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 lamp according to the manufacturer's instructions.

Item		Unit
(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, connections and aiming angle.

Item		Unit
(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. The contractor is to submit a report on the general condition of the kiosk or Distribution boards (damaged, rust marks, etc.)

Item		Unit
(d)	**Supply and install padlocks**	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 padlocks, locking devices and seals. Locks shall be "key alike".

Item		Unit
(e)	**Service area light pole**	No

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

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

Item		Unit
(f)	**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.

Item		Unit
(g)	**Replace pole**	No

The unit of measure shall be the number of 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 and installation of the pole in the position specified.

The contractor shall install all existing equipment onto the new pole

HE 10 SECURITY FENCE LIGHTING: TECHNICAL DETAILS

HE 10.01 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 poles. Lights are controlled by means of photocells and manual on/off switches.

HE 10.02 Scope of repair work

Open each pole cover and inspect fuse or circuit breaker, tray and shield plate as well as earthing connection. Check and replace cover seal if 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.

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.

Open each distribution Kiosk, clean inside provide termile and rodent poison. Check earth bar and earth continuity. Check and fasten cable terminations, fit labelling and blank face-plate covers. Check locking mechanism and fit padlock. Check earth connection to electrode.

Service luminaires by washing with detergent and re-lamping where necessary. Clean lenses. Check condition of seals and glands and test for earth continuity

HE 10.03 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, corrosion protection, straightening of poles if necessary, 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 are rotten (wood poles), bent (steel poles), and broken (wood, steel, concrete or fiberglass poles) or if the pole should be painted (steel). Strap all cable to pole.

Item		Unit
(b)	**Re-lamp luminaire**	No

The unit of measurement shall be the number of security 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 or distribution board, vermin protection, cleaning of circuit breakers, earth testing, secure circuit breakers and terminations and fitting of blank covers. The contractor is to submit a report on the general condition of the kiosk or distribution board (damaged, rust marks, etc.)

Item		Unit
(d)	**Replace luminaires**	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 luminaire complete with the lamp and control gear according to the manufacturer's instructions.

Similar or equal to Lascon L14ST 400W HPS Floodlight

Item		Unit
(e)	**Service luminaire**	No

The unit of measure 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 brackets bolts, checking of earthing continuity, checking of aiming angle and adjust if necessary

HE 11 STREETLIGHTING: TECHNICAL DETAILS

HE 11.01 Installation description

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

Luminaires are suspended on creosote and fibreglass poles of various lengths. Street lights are controlled by means of photocells and manual on/off switches.

HE 11.02 Scope of repair work.

Open distribution kiosk, check locks, clean inside, provide termite and rodent poison.

Open each mast cover and inspect fuse or circuit breaker, tray and shield plate as well as earthing connection. Check and replace cover seal if required. Wash luminaire, replace neoprene seal, clean lens and re-lamp luminaires if required. Replace luminaires: Remove existing damaged luminaires, supply and install similar and approved luminaires complete with lamps and control gear, if applicable. Assess aiming angle and adjust if necessary.

HE 11.03 **Repair work: Measurement and payment**

Item		Unit
(a)	**Service streetlight 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 cover, visual inspections, straightening of poles if necessary 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 are rotten (wood poles), bent (steel poles), and broken (wood, steel, concrete or fibreglass poles) or if the pole should be painted (steel). Strap all cable to pole.

Item		Unit
(b)	**Re-lamp luminaire**	No

The unit of measurement shall be the number of street light 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 street Luminaire**	No

The unit of measure 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 brackets bolts, checking of earthing continuity, checking of aiming angle and adjust if necessary

Item		Unit
(d)	**Replace streetlight luminaire**	No

The unit of measurement shall be the number of streetlight luminaires replaced.

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

Item		Unit
(e)	**Supply and install photocell bypass**	No

The unit of measure shall be the number of photocell bypasses installed.

The tendered rate shall include full compensation for the design supply and installation of the photocell bypass.

Item		Unit
(f)	**Replace 125MV choke in control gear.**	No

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

The tendered rate shall make full compensation for ordering, supply and installation of chokes.

Item		Unit
(g)	**Replace connection to streetlight luminaire.**	No

The unit of measure shall be the number of connections replaced from the streetlight luminaire to the overhead line.

The tendered rate shall make full compensation for ordering, supply and connection of the luminaire to the overhead line with silicon cable or air duct and cable clamps on to the overhead line.

HE 12 MAINTENANCE OF THE INSTALLATION

HE 12.01 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.

HE 12.02 The following maintenance actions will be required under this phase of the contract:

12.02.01 Routine preventative maintenance
12.02.02 Corrective maintenance
12.02.03 Breakdown maintenance

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

HE 12.03 The maintenance schedules and frequency of maintenance activities shall be developed under the maintenance control plan which will be instituted by the Contractor. The Contractors responsibility in this regard is specified in the Additional Specification SA – General Maintenance.

HE 12.04 **The following shall be used as guidelines to ensure effective maintenance:**

12.04.01 Scope of maintenance work on area lighting

a) 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

b) Annual

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

12.04.02 Scope of maintenance work on security lighting

a) Monthly

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

b) 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.

12.04.03 Scope of maintenance work on street lighting

a) Monthly

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

b) Annual

Measure phase voltages and line currents in distribution kiosk. Record values in Record book. Do vermin protection. Service all luminaries and distribution kiosks.

HE.12.05 Maintenance shall include all repairs, replacing of components or materials, routine setting or any other actions necessary to ensure a perfect functional condition.

HE.12.06 **Maintenance work measurement and payment.**

Refer to clause SA06 of the ADDITIONAL SPECIFICATION : SA GENERAL MAINTENANCE

TECHNICAL SPECIFICATION

JC CONVENTIONAL FIRE FIGHTING EQUIPMENT

CONTENTS

JC 01 SCOPE

This specification covers the general repair and maintenance of the conventional firefighting equipment installations, which include the following:

- Fire extinguishers

This specification shall form an integral part of the repair and maintenance 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 and, in the event of any discrepancies between the Technical Specification and the Particular Specification, the latter shall take precedence.

JC 02 STANDARD SPECIFICATIONS

JC 02.01 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 deemed to form part thereof.

JC 02.01.01 SANS and other specifications and codes

SANS 6172; ICS 13.220.10	- Fire extinguishers- Assessment of fire rating
CKS 532; ICS 13.220.10	- Fire extinguishers, foams
SANS 10105-1; ICS 13.220.10	- The classification, use and control of fire-fighting equipment Part 1: Portable fire extinguishers

SANS 1322; ICS 13.220.10	-	Portable, non-refillable fire extinguishers (general purpose type
SANS 1567; ICS 13.220.10	-	Fire extinguishers, portable, rechargeable, carbon dioxide
SANS 1573; ICS 13.220.10	-	Portable rechargeable fire extinguishers – CO2 type extinguishers
SANS 1475-1; ICS 13.220.10	-	Portable rechargeable fire extinguishers
SANS 810; ICS 13.220.10	-	Portable rechargeable fire extinguishers – dry powder type extinguishers
SANS 1522; ICS 13.220.10	-	Fire extinguishers, powders
SANS 1571; ICS 13.220.10	-	Transportable rechargeable fire extinguishers
SANS 10105-1; ICS 13.220.10	-	Portable rechargeable fire extinguishers
SANS 1322; ICS 13.220.10, 23.020.30	-	Portable, non- refillable fire extinguishers (general type purpose)
SANS 810; ICS 13.220.10	-	Portable rechargeable fire extinguishers – dry powder type extinguishers
SANS 1475-1; ICS 13.220.10	-	Portable rechargeable fire extinguishers
SANS 1456-1; ICS 13.220.10	-	General requirements and methods of test
SANS 10400	-	Application of the NBR

JC 02.01.02 **Department of Public Works Specifications:**

F.P.O/G.61/3E	-	Fire Security: A guide to Architects
OW 371	-	Specification of Materials and Methods to be used (Fourth revision, October 1993)

JC 02.01.03 **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, 1993 (Act no 85 of 1993) shall be adhered to.

JC 02.01.04 **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.

JC 03 OPERATING AND MAINTENANCE MANUALS

The Contractor shall be responsible for the compilation of an inventory list and operating and maintenance manuals.

This shall be done in accordance with Additional Specification SB: Operating and Maintenance Manuals.

All information shall be recorded and reproduced in electronic format, as well as three sets of hard copies to be supplied to the Department.

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

(a) Cataloguing of the fire safety equipment

All the fire safety 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.

JC 04 TRAINING OF OPERATORS FOR THE OPERATION OF THE INSTALLATION AND EQUIPMENT

The end user shall be trained, by the supplier of the firefighting equipment, to operate the individual firefighting equipment.

Firefighting training shall be done by a national accredited training institute (Fire Protection Association of South Africa).

JC 05 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. Copies of the monthly entries and recordings into the logbook shall be submitted by the Contractor 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.

JC 06 REPAIR WORK TO INSTALLATIONS, SYSTEMS AND EQUIPMENT

JC 06.01 GENERAL

During the repair and maintenance contract all the systems, installations and equipment shall be repaired as specified in the Particular Specification. This repair work shall include but no be limited to the specified Particular Specification details.

All repair work shall be executed using approved materials and equipment suitable to the systems and/or installations they serve. The said repair work shall be executed in accordance with the relevant codes of practice, standards, regulations, and by-laws, manufacturer's specifications and codes of practice and all applicable additional and particular specifications included in this document.

The repair work items are listed in the Particular Specification and Schedule of Quantities with all relevant details, such as capacity, size, manufacturer, model number, etc.

All repair work shall be executed within the specified durations listed in the appendix to tender. All new equipment, materials and systems shall be furnished with a written guarantee of a defects liability period of 12 months commencing on the date of issue of a certificate for completion of the repair work. These guarantees shall be furnished in favour of the Department of Public Works.

Repair work items for the firefighting equipment shall be categorised under the following headings:

- Fire extinguishers.

JC 06.02 REPAIR WORK OF EXISTING EQUIPMENT

The Contractor shall at the start of the repair and maintenance contract inspect, record and report on all the existing firefighting equipment 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 time of 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

JC 06.03 **FIRE EXTINGUISHERS**

Repair work to the fire extinguishers is detailed in the Particular Specification and shall include, but not be limited to the following:

(a) Replace wall mounting boards and brackets where damaged or missing.

(b) Dry chemical powder extinguishers shall be repaired and serviced and shall include at least the following:

(i) Replace discharge hose and nozzle where damaged or missing;

(ii) Replace gauge on bottle where reading is incorrect, damaged or missing;

(iii) Check, service and repair activation mechanism;

(iv) Replace DCP powder;

(v) Recharge discharge cylinder to the required capacity;

(vi) Reseal discharge mechanism;

(vii) Replace instructions on extinguishers where necessary;

(viii) Extinguishers shall be labelled with identifying tags and details recorded, including service record.

(c) CO_2 extinguishers shall be repaired and serviced and shall include at least the following:

(i) Replace discharge nozzle and pipe where damaged or missing;

(ii) Replace gauge on bottle where reading is incorrect, damaged or missing;

(iii) Repair activation mechanism;

(iv) Recharge with CO_2 to required capacity;

(v) Reseal discharge mechanism;

(vi) Replace instructions on extinguishers where necessary;

(vii) Extinguishers shall be labelled with identifying tags and details recorded, including service record.

(d) Water extinguishers shall be repaired and serviced and shall include at least the following:

(i) Check cylinder for corrosion and report to Engineer. Where directed, the complete unit shall be replaced;

(ii) Replace discharge hose and nozzle where damaged and missing;

(iii) Replace gauge on bottle where damaged, missing or where reading is incorrect;

(iv) Check service and repair activation mechanism;

(v) Replace water content;

(vi) Recharge discharge cylinder to the required capacity;

(vii) Reseal discharge mechanism;

(viii) Replace instructions on extinguisher where damaged or missing;

(ix) Extinguishers shall be labelled with identifying tags and details recorded, including service record.

(e) Foam type extinguisher shall be serviced and repaired and shall include at least the following:

(i) Check cylinder for corrosion and report to Engineer. Where directed, the complete unit shall be replaced;

(ii) Replace discharge hose and nozzle where damaged or missing;

(iii) Replace gauge on bottle where damaged, missing or incorrect;

(iv) Check, service and repair activation mechanism;

(v) Replace foam concentrate content;

(vi) Recharge discharge cylinder to required capacity;

(vii) Reseal discharge mechanism;

(viii) Replace instructions on extinguisher where damaged or missing;

(ix) Extinguishers shall be labelled with identifying tags and details recorded, including service record.

JC 07 MAINTENANCE TO INSTALLATIONS, SYSTEMS AND EQUIPMENT

JC 07.01 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, for the specified installations described under JC 01 of this specification.

The maintenance work to be performed and executed shall be done strictly in accordance with Additional Specification SA: General Maintenance and as specified in Particular Specification PJC and this specification.

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:

- Fire extinguishers.

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

JC 07.02 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.

JC 07.02.01 Fire extinguishers

Maintenance work shall include at least the following actions and shall be scheduled in accordance with the relevant regulations and requirements and include monthly and six-monthly inspections and services.

(a) General

(i) Check mounting of backboard and bracket.

(ii) Check charge of the extinguisher.

(iii) Check the condition of the discharge.

(iv) Check the mechanism condition of the discharge hose.

(v) Update the log entry on the extinguisher.

(vi) Log maintenance schedule.

(vii) Report defects for processing and repair.

(b) Individual types of extinguishers

Over and above the preceding requirements, the following shall apply to individual types of extinguishers.

(i) DCP extinguishers:
Check charge and replace powder at prescribed intervals.

(ii) CO_2 extinguisher:
Check charge.

(iii) Water extinguisher:
Replace water at pre-described intervals.

(iv) Foam extinguisher:
Check foam mix and replace at predetermined intervals.

JC 07.03 CORRECTIVE MAINTENANCE

This corrective 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 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.

JC 07.04 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.

TECHNICAL SPECIFICATION

K WATER AUDIT

CONTENTS

K 01 SCOPE

This specification covers the material, equipment, testing and maintenance required for the implementation of a water audit. It covers only the external water services comprising the water supply from the point of delivery and the associated distribution system.

K 02 STANDARD SPECIFICATIONS

K 02.01 GENERAL STANDARD SPECIFICATIONS, REGULATIONS AND CODES

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

SANS 10306 - Management of potable water in distribution systems
BS 1780 - Specification for Bourdon tube pressure and vacuum gauges

K 02.02 MECHANICAL PRESSURE GAUGES

(a) Analogue mechanical or Bourdon tube pressure gauges shall be of the bottom entry type and shall have faces at least 60 mm in diameter with clear, readable markings and indicators. The screw-in fitting shall be compatible with the pipe fitting, which shall be the metric equivalent of a ½ inch BSP internal thread unless otherwise specified. Threads shall be in accordance with BS 21 for jointing threads or BS 1387 for long screw threads. The Contractor shall provide the relevant details in the operation and maintenance manuals.
(b) The indicated range on the gauge shall span 120 % of the operational pressure range specified for the relevant equipment. Accuracy shall be within 3 % of the full-scale deflection value. An adjustable indicator shall be set to indicate the maximum operational system pressure clearly.
(c) It shall be possible to isolate the pressure gauge from the pressure pipe by means of a valve or a gauge cock, which shall be supplied and installed by the Contractor and shall be included in the tendered rate for the equipment.
(d) A gauge protector shall be fitted where a gauge has to indicate pressures in corrosive media or liquids that could easily clog the pressure ports. It is a requirement that gauge protectors be fitted where sludge is the working medium.
(e) Pressure gauges fitted to hydraulic pipelines shall be glycerine-filled for damping purposes, and gauges fitted to pneumatic or gas pipelines shall be vacuum-damped.
(f) The circumferential positioning of pressure gauges on water and sewerage pipes shall be in accordance with BS 5316: Part 1 class C, and the static head tapping shall also comply with these standards.
(g) Bourdon type pressure gauges shall comply with BS 1780.

K 02.03 DATA LOGGER SPECIFICATION

The data logger shall be a *Meinecke Cosmos* data logger or similar approved.

K 02.03.01 **Special features required**

The following special features are required of the data logger:

- Recording of analogue values (pressure) and flow simultaneously;
- Inputs may be used for either digital or analogue sensing devices;
- Three independent memories (day, hour and events);
- Positive and negative data logging;
- LC-display;
- Alarm contact;
- Battery-powered (independent of the mains power supply);
- Appropriate software included.

K 02.03.02 **Technical data**

Protection	IP68
Casing	Cast aluminium
Operating temperature	0 to 50 °C
Storage temperature	-10 to + 70 °C
System clock	Read time
Output	V.24/RS 232-compatible data interface to connect to the PC. All socket connectors are waterproof.
Alarm contact	FET open drain - 1 max 100 mA; U max 50 V

K 02.03.03 **Pressure sensor**

The sensor may be either:
- direct-connected to a 3/8" NPT thread nipple, or
- connected by an adapter to a 3/8" Whitworth female connection.

Material:

All parts which are in contact with the media and the housing must be manufactured from stainless steel.

Storage temperature	-55 to +100 °C
Operating temperature	-40 to +100 °C
Operating temperature interface	0 to +70 °C
Compensated range	0 to +70 °C
Media temperature	-40 to +125 °C
Accuracy	± 1,0 % FS at constant temperature
Non-linearity	± 0,2 % FS
Repeatability	± 0,5 % FS
Response time	1,0 ms

Pressure ratings (bar):	Operating pressure	Proof pressure[2]	Burst[3]
	0 - 20,70	31,0	345

(a) Sensor including interface;
(b) Maximum pressure without causing damage to the sensing elements;
(c) The media will be contained until this extreme pressure limit is exceeded.

K 03 DETAIL OF WORK

K 03.01 INSTALLATION OF WATER METERS

This section covers the installation and servicing of all water meters that will be used as part of the water audit process.

K 03.01.01 **Bulk water meters**

Bulk water meters at reservoirs shall be serviced. Meters not installed in accordance with the manufacturer's instructions shall also be rectified.

All reservoir outlets shall be metered.

All boreholes will be metered.

K 03.01.02 **Individual connections**

All individual connections within the reticulation shall be metered. Such connections shall include meters for individual buildings.

K 03.01.03 **Domestic water meters**

Meters for domestic water consumption shall be provided in above ground installations, but underground in secure areas.

K 03.02 ROUTINE INSPECTIONS OF PIPELINE ROUTES

The routes of all water supply pipelines shall be inspected for visible leaks. All leaks shall be properly logged and reported for corrective maintenance.

K 03.03 COMPILATION OF DATABASE

The Contractor shall compile a database to assist in effective management of the system. The database shall contain the following information:

(a) Meter serial number, size and make / type
(b) Installation position
(c) Meter reading on installation
(d) Date of installation
(e) Date last calibrated
(f) Consumer name

In the compilation of the database the Contractor shall ensure that the information required for the "water audit" software is also collected.

K 03.04 LEAK DETECTION AND CORRECTIVE MAINTENANCE

This clause covers the providing of additional equipment for implementing a water loss management programme in identified areas.

K 03.04.01 **Provision of data loggers**

The data loggers will enable the monitoring of flow patterns.

K 03.04.02 **Meter management**

All metered consumers must be incorporated into a billing system for the accurate compilation of monthly accounts for water consumed.

The billing system shall be user-friendly and cover at least the following aspects:

(a) Meter serial number;
(b) Consumer name, Postal and residential address;
(c) Meter reading at start and end of period;
(d) Dates of meter reading;
(e) Volume of water consumed;
(f) Unreadable accounts with associated reasons;

K 03.04.03 **Provision of software**

Software packages shall be provided to enable the following:

(a) Establishment of a meter database;
(b) Establishment of a user-friendly database;
(c) Water audit (WAR)

K 04 MEASUREMENT AND PAYMENT

K.01 **WATER AUDIT MANAGEMENT SYSTEM**..... Unit: site

The tendered sum shall include for the provision of the software and the input of all the initial data per site.

The unit of measurement shall be per site for the complete compilation of a meter management system sufficient for management of the installation. The tendered rate shall include fc

The unit of measurement shall be the sites for which software packages are provided. The tendered rate shall include for the supply, delivery and installation of the relevant software. All associated labour costs shall be included but, the associated computer hardware costs are to be excluded.

The unit of measurement shall include the data loggers supplied and delivered.

The tendered rate shall include full compensation for the corrosion protection, patent rights, royalties, transport, installation and all other costs and actions required for the supply and delivery of data loggers as specified.

The tendered rate shall furthermore include full compensation for the site handling, positioning, installation, testing and commissioning of the data loggers as specified, including all other costs and actions required to obtain a fully functional system for flow measurement. All actions required as part of the software installation shall be included.

TECHNICAL SPECIFICATION

L ELECTRICAL INSTALLATIONS

CONTENTS

L 01 SCOPE

L 01.01 This specification comprises all aspects regarding the maintenance and servicing of building electrical systems. Building electrical systems comprise:

(i) Distribution boards and low voltage cable
(ii) Interior and exterior lighting of buildings
(iii) Minor power and fixed appliances
(iv) Earthing and lightning protection system

L 01.02 This specification shall form an integral part of the maintenance and service contract document and shall be read in conjunction with the Additional Specifications included with this document.

L 02 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

L 02.01 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.

L 02.02 SANS Specifications

General	Distribution and meter boards	LV cables and conductors	Lighting system	Earthing and lightning protection system	Minor power installation	
					Power outlets	Conduits, power skirting, cable trays and ducting
SANS 10142-1	SANS 152	SANS 0198	SANS 10114-1	SANS 03	SANS 152	SANS 950
SANS 10160	SANS 156	SANS 1411-1	SANS 163	SANS 0199	SANS 164	SANS 1065-1
SANS 10400	SANS 172	SANS 1507	SANS 1012		SANS 1084	SANS 1085
SANS 1222			SANS 1084		SANS 1239	
			SANS 1250			
			SANS 1279			
			SANS 1777			
			SANS 10114-2			

L 02.03 Department of Public Works Specifications PW 774 and PW 343.

L 02.04 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.

L 02.05 Manufacturer's specifications and installation instructions

L 02.06 **Additional requirements**

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

L 03 ELECTRICAL INSTALLATION TECHNICAL DETAILS

L 03.01 Installation description

A complete description of the installation is contained in additional specification
SS: Site Specific Inventory

L 03.02 Scope of maintenance and servicing work

L 03.02.01 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.

(i) Trace outgoing circuits.

(j) Fit labelling and blank face plate covers.

L 03.02.02 Lighting system

(a) Indoor luminaires

- Remove lamps and wash luminaire body with detergent. Clean polycarbonate diffusers with detergent. Clean polished pure aluminium diffusers / reflectors with benzene.
- Check condition of luminaire seal, entrance gland, lampholder 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.

(b) Light switches

- All light switches shall have steel faceplates with labels.
- Remove switch cover.
- Check continuity of earth connection.
- Check operation of switch.
- 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 ø Sprague.

(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

TYPE	DESCRIPTION
A	2 x 58W SLS OPEN CHANNEL FLUORESCENT LUNINAIRE - LASCON TYPE : R1-258 SS
E	2 x 58W SLS IP 55 FLUORESCENT LUMINAIRE - LASCON TYPE: WITH PRISMATIC DIFFUSER
F	2 x 58W SLS IP 55 FLUORESCENT LUMINAIRE - LASCON TYPE : C2-258SS WITH WATERTIGHT DIFFUSER
I	80W MV B40 BRITELITE WALL MOUNTED BULKHEAD LUMINAIRE : LASCON TYPE B40-80W MV
J	400W MV SLS APPROVED HIGH BAY LUMINAIRE WITH AUTO LIGHT SIMILAR OR EQUAL TO BEKA BAY
K	BULKHEAD LUMINAIRE - LASCON TYPE: B10 WITH 2XPL9 LAMPS
P	125W MV FLOODLIGHT LUMINAIRE WITH GRP BODY: ILM TYPE: GAL/GRP/125/MV
Q	400W HPS FLOODLIGHT LUMINAIRE : LASCON TYPE : L14ST-400 HPS
R	250W HPS FLOODLIGHT LUMINAIRE : LASCON TYPE : L14ST-250 HPS
T	BOWL TYPE IP55 BATHROOM FITTING WITH CERAMIC LAMP HOLDER WITH DULUX EL ECO 21W/E27 LAMP
U	DÉCOR ROUND CHEESE BULKHEAD 250 MM GLASS BOWL-ILM TYPE: DEC/RND/CHS/250 WITH 21 W DULUX EL ECO LAMP
V	WALL MOUNTED DÉCOR SINGLE SPOT LIGHT ILM TYPE : ACC/SPT/100
W	CEILING MOUNTED 2-WAY SPOT LIGHT WITH DULUX EL ECO 21W/E27 LAMPS
X	CEILING MOUNTED 3-WAY SPOT LIGHT WITH DULUX EL ECO 21W/E27 LAMPS

L 03.02.03 Power outlets and fixed appliances

Note: All power outlets shall have steel faceplates with 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) Check conditions and operation of local isolators and control switches for fixed equipment and replace if faulty, damaged or missing.

(e) Check earthing of fixed appliances and test for earth continuity.

(f) Inspect cable and wireways.

(g) 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.

L 03.02.04 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) Check 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 50 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) Check 50mm aluminium roof conductor in galvanised conduit from the roof cladding against the building to the earth electrode.

L 04 MEASUREMENT AND PAYMENT

L.01 **Service distribution board**.....No

The unit of measurement shall be the number of distribution kiosks or boards opened and serviced as specified in Clause L 03.02.01.

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

L.02 **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.

L.03 **Wiring**.....m

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

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.

L.04 **Circuit breakers**.....No

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

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.

L.05 **Isolators**.....No

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

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

L.06 **Contactors**.....No

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

The tendered rate shall include full compensation for the supply and replacement of the specified type of contactor, including engraved labelling on rear tray.

L.07 **Earth Leakage Units**.....No

The unit of measurement shall be the number of earth leakage units supplied and replaced.

The tendered rate shall include full compensation for the supply and replacement of the specified type of earth leakage units, including labelling.

L.08 **Surge arrestors**.....No

The unit of measurement shall be the number of surge arrestors supplied and replaced.

The tendered rate shall include full compensation for the supply and replacement of the specified type of surge arrestors, with visual indication.

L.09 **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 replacement of the specified lamp according to the manufacturer's instructions.

L.10 **Service luminaire**.....No

The unit of measurement shall be the number of luminaires opened and serviced In accordance with Clause L 03.02.02.

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 tightening of all connections

L.11 **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, according to manufacturer's instructions.

L.12 **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, spray painting, 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 a label as per Nosa-standard.

L.13 **Light switch**.....No

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

L.14 **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 a label as per Nosa-standard.

The tendered sum shall further include for replacement of any missing outlet covers and fixing screw and earth testing.

L.15 **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 a label as per Nosa-standard.

L.16 **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.

L.17 **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 component.

The rate shall further include the disconnection and removal of the faulty component and the installation and testing of the new component.

L.18 **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 component.

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.

L.19 **Testing of the earth installation by a specialist contractor**.....No

The tendered lump sum shall include full compensation for the testing of the earth installation by a specialist contractor approved by the Engineer per building.

MONANTSA PASS AND PEKA BRIDGE PORTS OF ENTRY: REPAIR, MAINTENANCE AND SERVICING OF BUILDINGS, CIVIL, ELECTRICAL AND MECHANICAL INFRASTRUCTURE AND INSTALLATIONS (36 MONTHS)

PART C3.3:

ADDITIONAL SPECIFICATIONS

PORTION 3: ADDITIONAL SPECIFICATIONS

ADDITIONAL SPECIFICATION

SA MAINTENANCE AND SERVICING

CONTENTS

SA 01 SCOPE

Maintenance and Servicing of the specified systems, services and/or parts of buildings and infrastructure shall all be referred to as "Maintenance and Servicing of an Installation". Maintenance and statutory periodical servicing of all installations shall ensure reliable functioning and optimum service life thereof.

Monthly maintenance and servicing responsibilities for each installation, including all units and components as specified, shall commence with access to the site. Maintenance of an installation shall be performed in accordance with the Technical Specifications, the Operating and Maintenance Manuals (where applicable) and the Maintenance Control Plan.

Remuneration for maintaining "installations" (systems, services and/or buildings and parts of the infrastructure) in good functional condition as well as servicing of various installations is provided for in the Schedules of Quantities by means of monthly payment items and scheduled servicing items.

This Additional Specification covers maintenance and servicing requirements, development of a maintenance control plan (MCP), site maintenance administration, logging water- and electricity consumptions, maintenance performance measurement, as well as the items for measurement of the Contractor's service level and resulting payment.

SA 02 MAINTENANCE AND SERVICING APPROACH

The Contractor is expected to be represented on **site full time**. Contractor must allow for the appointment of a qualified project manager to be available on site on a full time basis for the duration of the contract.

SA 02.01 ROUTINE PREVENTATIVE MAINTENANCE VISITS

When submitting the maintenance control plan (MCP), the Contractor shall schedule "routine preventative maintenance visits" to the site. A "routine preventative maintenance visit" shall be scheduled for the intervals as indicated in the table below. The duration of a "routine preventative maintenance visit" will depend on the time required to complete all routine preventative maintenance, corrective maintenance as well as breakdowns logged during the course of the month as specified. However, a "routine preventative maintenance visit" may never be less than the minimum period specified in the table below. The Engineer will carry out a site inspection on any arbitrary day and measure the quality of maintenance and servicing. The Engineer will also inspect correction/repair of breakdowns that were logged with the Contractor during the course of the month.

INSTALLATION	FREQUENCY OF ROUTINE MAINTENANCE VISIT	MINIMUM DURATION OF ROUTINE MAINTENANCE VISIT
MONANTSA PASS PORT OF ENTRY	**3 days a week** (Monday, Wednesday, Friday)	5 hours
PEKA BRIDGE PORT OF ENTRY	**4 days a week** (Monday, Tuesday, Wednesday, Friday)	4 hours

The Contractor should indicate to the Engineer within 21 days after the site handover the days of the week which he would visit the site for his scheduled routine maintenance visits including the various resources allocated for the different preventative maintenance actions, site keeping and cleaning services to be performed. Qualified electrician and plumber should be available for the above mentioned dates.

SA 02.02 EMERGENCY BREAKDOWN VISIT

Whenever an emergency breakdown is logged with the Contractor, an "emergency breakdown repair visit" shall be carried out by the Contractor to attend to the repair of the emergency breakdown within **12 hours** after it was logged with the Contractor.

Remuneration for the material and labour required to attend to repair of the emergency breakdown shall be deemed included in the payment item for maintenance of an installation based on a point system and measured monthly. Payment for the "emergency breakdown repair visit" will be measured separately in the schedule of quantities to cover the cost of the call-out, in terms of travel and accommodation cost, including travel time and any other cost associated with the call-out. No payment for the "emergency breakdown repair visit" shall be done if the call-out coincides with any of the monthly scheduled maintenance visits as listed in SA 02.01.

The Contractor will only be remunerated for *emergency breakdown repair visits* upon instruction of the Engineer or his representative.

Typical examples of "emergency repair breakdown visits" would be:

- A Breakdown of any standby power generator that prevents the standby power generator from operating at its capacity and meeting the demand.
- A Breakdown of any water supply pump or any other component of the water supply or bulk water installation that affects the water supply to such an extent that it cannot meet the demand
- A Breakdown of the water reticulation network or sewer reticulation network that affects water supply or sewer removal to such an extent that the service is disrupted to any site.
- A Breakdown of site electrical or building electrical that disrupts power supply to a building (including residential unit)
- A Breakdown of a geyser that prevents it from supplying hot water as per specification
- Any other Breakdown that can be regarded as having the potential to cause damage to equipment or property and is included in the scope of work to be maintained and serviced by the Contractor, as per specifications. *The Engineer or his representative will be responsible for categorising a breakdown as an emergency.*

SA 03 MAINTENANCE REQUIREMENTS

SA 03.01 CONTRACTOR'S RESPONSIBILITIES

The Contractor shall maintain and service the installations for the 36-month Contract period.

Maintenance implies and shall include monthly routine preventative maintenance, corrective maintenance, as well as breakdown maintenance on all components of the specified installations.

The maintenance control plan (MCP) will be developed by the Contractor at the start of the contract, to schedule the frequency of routine inspections and format of reports. The Contractor shall carry out inspections on the equipment as detailed in the Specifications and the maintenance control plan. Each inspection, test or breakdown shall be recorded in an approved format and listed in a monthly report (part of the maintenance control plan).

The Contractor shall ensure through training that the operating and maintenance personnel are conversant with the instructions and procedures for operating and maintaining the various installations.

The specifications, maintenance control plan, and (where applicable) the Operating and Maintenance Manuals, shall be used as a basis for routine preventative maintenance.

The Contractor shall, as part of his maintenance responsibilities, repair or replace faulty equipment upon logging of a breakdown, within the down-time as defined in Clause SA 06.02 at the Contractor's cost, *except* in the event of replacement being labelled as exceeding liability as specified in of the Project Specific Conditions of Contract, in which case the Department of Public Works will bear part of the costs or in the event of a damaged breakdown.

The Contractor shall rectify any faulty condition of which he becomes aware, even if it has not been logged. Such rectification shall also be logged and listed in the monthly report.

SA 03.02 **CONDITIONS FOR EXCEEDING THE CONTRACTOR'S LIABILITY DUE TO DAMAGE BREAKDOWNS**

In the event of damage caused to the installation or any part thereof, the repair and/or replacing of necessary parts of the damaged installation shall be performed by the Contractor. Damage shall be defined for the purpose of this clause as being any damage caused on purpose or through negligence by the User Client's employees, suppliers, subcontractors, etc for any reason whatsoever. For the purpose of this clause, damage and vandalism shall have the same meaning. Where repair work is necessitated as a result of damage caused by User Clients or their associates, the Contractor will be requested to:

(a) perform work, using tendered rates for the supply, delivery and installation of material forming part of the *corrective maintenance schedule*, within the maximum down-time allowed for damage, where the Engineer rules that the damage has been caused maliciously;

(b) submit one (1) quotation for repair and/or replacement of the damaged unit, where tendered rates are not available and where the Engineer rules that the damage has been caused maliciously;

(c) perform the work on receipt of an order from the Engineer, within the time offered as part of the quotation, and

(d) notify the Engineer well in advance of completion of the repair work in order to enable inspection.

No additional call-out cost, travelling or accommodation shall be paid to the contractor, and CPA shall be applicable to repair rates. Even though preventative maintenance of *building structural* is not included in the monthly maintenance points, instruction can be given to the contractor to repair building structural elements damaged under this item. The contractor shall be expected to do the repair work during his routine maintenance inspection, and billed corrective maintenance items shall be used to pay for the cost thereof. The responsibility of determining whether damage to the installation was caused maliciously by people other than the Contractor shall rest with the Engineer or his representative. Damage caused by the employees, suppliers, subcontractors, etc of the Contractor, shall be repaired by the Contractor at his own cost.

SA 03.03 **CONDITIONS FOR EXCEEDING THE CONTRACTOR'S LIABILITY ABOVE MARGINAL BREAKDOWN COST**

In the event where the cost for the repair or replacement of any **single component/subassembly** or where a breakdown has occurred due to a single failure, or where the cost for replacing a single item of equipment completely, exceeds the value of R15 000,00 (transport, accommodation and travelling cost *excluded*), the liability of the Contractor is limited to the value of R15 000,00. The additional cost above the value of R15 000,00 will be paid for by the Employer provided that conditions 1, 2 and 3 below have been met.

1. The defective part/component/subassembly or machine must be identifiable as a single subassembly or component and not the total of a number of small defects or breakdowns on subassemblies/components on any one or more machines.

   Examples of subassemblies/components are the following:

   (a) Should the wiring or bearings on an electric motor fail, the complete motor must be removed for repairs and the cost for the repairs on the complete motor will be regarded as repairs on a single subassembly/component.

(b) A starter motor, for example, is a subassembly, which can be removed from the machine for repairs. The repairs on the starter motor together with the repairs on the main bearings will not be regarded as a repair on a single subassembly/component. If the complete diesel engine is replaced with its associated subassemblies the replacement of the complete unit will be regarded as a single component.

(c) A pump as a whole is regarded as a single component. The pump and driving machine on long coupled pumps are regarded as separate subassemblies. Pumps and motors on close-coupled equipment are regarded as a single component. The pump and motor of a sump pump are therefore regarded as a single component.

(d) Control equipment for the control of a single item, with the sensing device, the controller itself and the final controlled variable are regarded as a single component of the system. The repairs on any one item on a controller have an influence on the rest of the control equipment and must after the replacement be commissioned again as a unit.

2. The Contractor shall submit a written report to the Engineer for approval. This report shall contain the following information:

(a) The make and model number of the machine serviced/inspected/ repaired/replaced;

(b) The identification number of the machine;

(c) A description or name and part number of the defective part/component or subassembly;

(d) A statement on whether the component could be repaired, together with a cost estimate;

(e) A quotation valid for a minimum period of 60 days if the component/part/subassembly has to be replaced or repaired by an outside firm. If the subassembly/machine is to be repaired or replaced by an outside company, the Contractor shall supply one (1) quotation for such parts/repairs or a quotation from any sole supplier. Only an original quotation will be accepted. The mark-up on such work shall be a percentage of 7,5% or shall be taken equal to the contractor's average mark-up for related tendered items and shall be applicable to the total cost (VAT excluded) of repair work by outside companies;

(f) The delivery time of a new component/subassembly/machine or delivery times on spares required to repair the defective component/ subassembly.

3. A written approval to proceed with the work must be issued by the Engineer. Copies of the original VAT invoices from outside companies for all repairs or spare parts supplied must be attached to the Contractor's invoice.

SA 03.04 COMPONENTS INCLUDED IN MAINTENANCE AND SERVICING SCOPE

The following main sections with its subsections as set out in the Specifications where applicable will each be deemed "an installation". Maintenance and servicing, as specified, will be applicable to the Buildings (Wet Services and Building Electrical), Roads, Stormwater, Water distribution, Sewer Networks, Standby Power generation, External Lighting, Water Purification Works, Septic Tanks/Waste Water, HVAC Installations and Fire fighting equipment at the following Ports of Entry:

- **Monantsa Pass Port of Entry**
- **Peka Bridge Port of Entry**

Note that Building structural and building related installations are excluded from the maintenance portion of the contract, *however*, **ad-hoc repair work of damaged items can be instructed for by the Engineer and are to be performed during the contractor's routine preventative maintenance visit *at rates as scheduled in the corrective maintenance section of the bills of quantities* (CPA applicable) – No additional fixed or time related Preliminary and General Charges will be applicable to such repair work.** Furthermore, breakdowns can be logged for items requiring attention, which will also be attended to by the contractor.

In general, additional corrective maintenance work may be instructed for by the Engineer or his representative and are to be performed during the contractor's routine preventative maintenance visit *at rates as scheduled in the corrective maintenance section of the bills of quantities* (CPA applicable) – No *additional* fixed or time related Preliminary and General Charges will be applicable to such work.

The Engineer may at any time inspect any part of the entire installation. During Maintenance and Servicing work, the Engineer shall at his discretion order special tests to be carried out on installations to verify the satisfactory functional condition of the installation.

SA 03.05 COMMENCEMENT OF MAINTENANCE PERIOD

Maintenance responsibilities for an installation shall include maintenance of all individual units, equipment or components shall commence immediately at the start of the Contract.

SA 03.06 PREVENTATIVE MAINTENANCE: DEFINITION

This entails the rendering of services and servicing of equipment according to a predetermined maintenance control plan to:

(a) replace and service components of equipment, units or parts thereof for each installation at prescheduled moments regardless of condition;

(b) readjust, reset, clean, corrosion protect all components of equipment, units or parts thereof for each installation, and

(c) all implied actions to maintain installations in a perfect functional condition.

Routine preventative maintenance shall be aimed at minimisation of breakdowns.

SA 03.07 CORRECTIVE MAINTENANCE: DEFINITION

This entails regular observation of the equipment, identifying pending breakdowns, maladjustment or anomalies of equipment, units or parts of installations and subsequent action to restore installations to the perfect functional condition as specified.

SA 03.08 BREAKDOWN MAINTENANCE: DEFINITION

This entails repair and/or replacement of defective equipment, units or parts of installations following a breakdown that leaves the installation inoperable or unsafe, and subsequent action to restore installations to the perfect functional condition as specified, within the maximum down-time allowed.

SA 03.09 SERVICING

This entails mandatory periodical services included for payment in the bills of quantities which shall be measured separately for payment, and performed on the intervals as instructed for by the Engineer.

SA 03.10 SITE MAINTENANCE RECORD KEEPING

The Contractor shall provide and maintain hard-cover A4 maintenance files for each installation for the duration of the Contract. All schedules, checklists, breakdown reports, preventative maintenance records, component replacement records and monthly reports shall be filed, together with information regarding repairs exceeding the Contractor's liability, as set out in SA 03.02 and SA 03.03.

Site maintenance records shall be submitted at each monthly meeting.

SA 03.11 SUPPLY OF LABOUR, EQUIPMENT AND MATERIAL

SA 03.11.01 Labour

Competent personnel that have been trained by the Contractor shall execute all maintenance and servicing work.

SA 03.11.02 Equipment

All tools and equipment required for maintenance and servicing work shall be supplied by the Contractor at his cost.

SA 03.11.03 Material

All material, spare parts, components, equipment and appurtenances necessary for the complete maintenance and servicing of each installation shall be supplied and installed by the Contractor at his cost, to a maximum value per part/subassembly as specified in the Project Specific Conditions of Contract for exceeding Contractor's Liability.

SA 04 MAINTENANCE CONTROL

SA 04.01 SCOPE

Maintenance quality control shall be the responsibility of the Contractor. The Contractor shall introduce a **maintenance control plan** to ensure that preventative, corrective and breakdown maintenance, site keeping and cleaning and servicing are performed as described in the Specifications.

SA 04.02 MAINTENANCE CONTROL PLAN

The maintenance control plan shall be bound in a neat, A4-sized, ring bound document with a cover page and back cover. The contents of the document shall be indexed. In drawing up the document, the Contractor may reproduce relevant paragraphs and clauses from any of the specifications forming part of the Contract documents, but should there be any discrepancies between such clauses and paragraphs in the maintenance control plan and those in the Contract documents, those in the Contract documents shall be regarded as being correct and shall apply.

The maintenance control plan shall at least contain the following:

(a) A summary of the maintenance and servicing work to be carried out under the contract.

(b) Details of how the Contractor intends to carry out the various types of maintenance and servicing work especially breakdown maintenance should breakdowns occur.

(c) Programme of preventative maintenance actions, site keeping and cleaning operations on a daily basis.

(d) Resources allocated for the various actions as per item (c) above (incorporating possible staff shortages during public holidays and festive periods.

(e) Details of how the call centre operates, as specified below as well as statistics of breakdowns, leakages, blockages, etc. available from the call centre for the installation shall be taken into account in compiling the contents of the maintenance control plan.

(f) A list of organisations and persons directly involved with the Contract or those whose requirements have to be taken into account during the 36-month contract period such as the Department of Public Works, the User Client, the Consulting Engineer, the Contractor, the Local Authority, etc. Each person's position within his organisation as well as the applicable phone numbers shall be given.

(g) Reports to be submitted after every routine inspection (all reports, checklist, breakdowns records, score card results, consumption sheets, etc. for each system of an installation shall be kept on the site in a hard cover file)

(h) Procedures to address complaints and logged breakdowns;

(i) Updated key plan with numbers and locations of manholes, fire fighting equipment, etc.

(j) Monthly reports, summarising all inspections, together with inspection data such as nature of test, names of persons carrying out tests and inspection results. Detail of services, corrective maintenance actions and replacements, together with testing of equipment shall also be reflected in this report.

The codes of practice as set out in ISO 10006 and ISO 9004 for quality systems and management shall be used as a guideline for compiling a maintenance control plan. ISO accreditation is not a requirement in terms of this Contract.

The maintenance control plan shall be upgraded when its contents are no longer representative of the actual conditions.

SA 05 COMMUNICATION

The maintenance control plan (Clause SA 04) will provide, after agreement between the Contractor and the Engineer, for the following communication and complaint logging procedure:

(a) The Contractor shall establish a telephone line, fax line and a cellular telephone connection to ensure that he can be reached at any time (**24 hours per day, 365 days a year**).

(b) The Contractor shall primarily be responsible for determining the items requiring preventative, corrective, breakdown maintenance and servicing and shall communicate this information directly to his maintenance workforce.

(c) Should the Engineer suspect that preventative, corrective or breakdown maintenance or servicing is required, a call shall be logged through the call centre to reach the Contractor as soon as possible.

(d) Reaction times will be as described in Clause SA 06.02.

(e) All complaints of the User Client shall be reported to the Engineer via the call centre, as set out in the maintenance control plan, and the Engineer shall issue instructions to the Contractor. After the Contractor has attended to the complaint, he will notify the Engineer or his representative in writing (faxed BS3 form), and the Engineer will provide feedback to the call centre.

The call centre logs the details of the Engineer's call and provides feedback to the complainant.

SA 06 PERFORMANCE MEASUREMENT

The Contractor's performance shall be measured against the following parameters:

SA 06.01 SPECIAL TESTING OF AN INSTALLATION

The Engineer may at any time inspect any part of the entire installation. During Maintenance and Servicing work, the Engineer shall at his discretion order special tests to be carried out on installations to verify the satisfactory functional condition of the installation.

The Contractor shall provide all equipment, tools and instruments required for testing.

SA 06.02 MAXIMUM MAINTENANCE DOWN-TIME

After a complaint has been logged and forwarded to the Contractor, the Contractor shall be expected to minimise the maintenance down-time until the system component is fully operational to the satisfaction of the Engineer. Should the Contractor not respond within the maximum down-time, the Engineer may arrange, at the cost of the Contractor, for the necessary repair work to be done by others.

Should the actual down-time exceed the maximum down-time the Contractor shall be liable to a payment reduction for the difference between actual down-time and maximum down-time. This is reflected in the table below:

REQUIRED MAINTENANCE	MAXIMUM DOWN-TIME ALLOWED	PAYMENT REDUCTION IF EXCEEDED
Emergency Breakdown	12 Hours	R 150/hour
Ordinary Breakdown	5 Days	R 200/day
Malicious damage	7 Days	R 200/day

"Maximum down-time" shall mean the period of time allowed to repair a breakdown, and "actual down-time" shall mean the measured period from the instant when the breakdown was logged with the Contractor until the installation has been repaired to its functional specification.

"Emergency breakdown" shall imply any breakdown repair work required to rectify a component or unit of the installation as specified under SA.

Emergency breakdowns shall be repaired within 12 hours after it was logged with the Contractor. The Contractor will be remunerated for the call-out by means of a re-measurable payment item as measured in the schedule of quantities ***only if the breakdown does not coincide with a scheduled routine maintenance visit.*** Material and labour cost is deemed to be included in the payment item for "maintenance of an installation" that is based on a point system and measured monthly.

"Ordinary breakdown" shall imply all breakdown repair work required other than emergency breakdowns. Ordinary breakdowns shall be repaired during the following "routine preventative maintenance site visit". Ordinary breakdowns will be logged with the Contractor on a continuous basis, and it will be the responsibility of the Contractor to attend to these breakdowns with the following "routine preventative maintenance site visit", and report back to the Engineer as soon as the breakdowns have been attended to.

SA 06.03 PERFORMANCE-BASED PAYMENT

Remuneration for all *time-related* preliminary and general charges shall be measured for payment in the bills of quantity on a monthly basis.

SA 06.03.01 Score-card

The Engineer shall inspect each installation monthly on any arbitrary day of the month or with the maintenance control meeting (held quarterly). The Engineer shall use a score-card to measure the quality of routine preventative and corrective maintenance on all components that form part of the installation, in accordance with the maintenance specifications. The Engineer will record his inspection directly onto the score-card. The score-card shall serve to evaluate ten performance indicators each month. The Contractor shall always have the opportunity to score the maximum points, provided that his routine preventative and corrective maintenance work comply with the Specifications. Statutory periodical services as measured in the bills of quantity shall not form part of the score-card payment items (and shall be paid for separately).

SA 06.03.02 Performance indicators

Performance indicators shall be selected to measure the Contractor's service level of routine preventative and corrective maintenance.

The Contractor and the Engineer shall each have the opportunity to select five (5) performance indicators each month, which shall focus on the measurement of maintenance quality against the relevant specifications for the ensuing month.

The Contractor shall aim to perform satisfactorily on at least ten performance indicators. The Contractor shall have knowledge of all ten selected performance indicators. All indicators shall be selected from the scope of his normal routine preventative and corrective maintenance work and shall be based on the maintenance control plan, specifications and operating and maintenance manuals. The work shall either be satisfactory, or unsatisfactory, and the Contractor shall score 1 or zero respectively per indicator. Performance indicators shall be used to focus on certain key aspects of the work and shall in no way limit the Contractor's responsibility to do all the required work. Should the contractor not select five performance indicators, the Engineer shall reserve the right to provide the Contractor's five performance indicators.

SA 06.03.03 Satisfactory performance

The Engineer or his representative shall inspect the site on any arbitrary day to measure the quality of maintenance against the ten selected performance indicators. Should the Contractor score the maximum points (10) he shall receive his full maintenance payment for the installation. Should the quality of routine preventative maintenance, or components requiring persistent corrective maintenance be unsatisfactory according to the score-card, the Contractor may fail to achieve full payment due to a reduced service level. Each monthly payment for maintenance shall be subject to evaluation based on the score-card.

A copy of the score-card including a guideline for the use thereof is included in this Specification.

SA 07 PREVENTATIVE MAINTENANCE ACTIONS

The preventative maintenance actions for the various installations for preventative maintenance are described in this section. Remuneration for maintenance of the infrastructure shall be deemed included in the tendered monthly payment for the respective installations

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

The maintenance schedules and frequency shall be developed under the maintenance control plan to be instituted by the Contractor.

The maintenance and servicing 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 forming part of the Maintenance Control Plan.

The Port of Entry consists of various facilities, as listed in additional specification SS: Site Specific Inventory. The preventative actions required are divided into maintenance installations and grouped as follow:

1. Plumbing and Drainage

- SA 07.01 – Plumbing and Drainage Installations

2. Electrical Installations

- SA 07.02 – Electrical Installations

3. Fencing, Refuge Removal and Pest Control

- SA 07.03 – Fencing
- SA 07.04 – Refuge removal and Pest Control

4. Cleaning and Site Keeping

- SA 07.05 – Cleaning and Site Keeping

5. External Water and Sewer Networks

- SA 07.06 – Water Distribution Networks
- SA 07.07 – Water Reservoirs and Pressed Steel Tanks
- SA 07.08 – Borehole Pump Systems
- SA 07.09 – Water Pump Systems
- SA 07.10 – Sewerage Networks
- SA 07.11 – Wastewater Pump Systems

6. Roads and Stormwater Drainage

- SA 07.12 – Roads
- SA 07.13 – Stormwater Drainage

7. External Lighting and Standby Power

- SA 07.14 – External Lighting
- SA 07.15 – Low Voltage Distribution Network
- SA 07.16 – Standby Power Systems

8. Heating, Ventilation and Air-Conditioning Systems

- SA 07.17 – Heating, Ventilation and Air-Conditioning Systems

9. Fire Fighting Equipment

- SA 07.18 – Fire Fighting Equipment

10. Water Works

- SA 09.02 – Water Treatment Works

SA 07.01 PLUMBING AND DRAINAGE INSTALLATIONS

RAINWATER DISPOSAL SYSTEM

NO	PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Clean out and clear all rainwater gutters and full bores	Bi-monthly
2	Clean out and clear all catch pits, channel drains and floor outlets	Bi-monthly
3	Clean and unblock all drain pipes	Bi-monthly
4	Check alignments of gutters	Six-monthly
5	Check and inspect all rainwater outlet gratings and replace if necessary	Six-monthly
6	Check gutter and pipe bracketing system	Four-monthly
7	Check and inspect manhole covers and frames for damages or missing	Monthly

SOIL AND WASTEWATER DRAINAGE SYSTEM

NO	PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Check, inspect and clean out all gullies	Monthly
2	Replace broken or missing gully gratings	Monthly
3	Check, inspect, repair or replace all manhole covers and frames	Bi-monthly
4	Check, inspect and repair manhole benching	Four-monthly
5	Check, inspect, repair or replace all inspection eyes, end caps and cleaning eye covers	Monthly
6	Check, inspect, repair or replace all bracketing systems	Four-monthly
7	Check, inspect, report and unblock any blockage that occurs	Monthly
8	Check, inspect, service, repair/replace all vacuum and two-way vents	Four-monthly

DOMESTIC WATER DISTRIBUTION AND RETICULATION SYSTEMS

NO	PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Check, inspect, report and repair leaks	Monthly
2	Replace all valve gaskets, gland packings and seals	Annually
3	Check, inspect, service, repair and readjust all pressure-reducing valves	Annually
4	Check, inspect and test operation of all valves on site	Four-monthly
5	Clean out all strainers	Monthly
6	Check, inspect, service test and repair/replace all safety and expansion release valves	Six-monthly
7	Check, inspect, repair or replace all bracketing systems	Four-monthly
8	Check, inspect, service, repair/replace all air release valves and vacuum breakers	Four-monthly
9	Check, service, repair or replace all ball float valves	Four-monthly

10	Check, inspect, test, service, repair all geyser installations	Four-monthly
11	Check, inspect, test, service and repair all non-return valves	Four-monthly

SANITARY AND BRASSWARE EQUIPMENT

NO	PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Inspect, repair/replace WC seats and covers	Monthly
2	Replace all tap washers	Annually
3	Replace all tap gland packings	Annually
4	Check, inspect, repair, fix and where necessary replace sanitary ware mountings and brackets	Four-monthly
5	Check, inspect, service, repair/replace all cistern flushing mechanisms	Monthly
6	Check, inspect, service, repair/replace all brassware	Four-monthly
7	Check, inspect, service, repair/replace all sanitary ware	Four-monthly
8	Check, inspect, service, repair, readjust all flushing valves	Four-monthly
9	Replace all flushing valve internal parts with replacement kits	As occur
10	Stained equipment to be cleaned with approved manufacturer's cleaning agent	Six-monthly
11	Check, inspect, report and repair all leaks	Monthly
12	Check, inspect, repair/replace all shower gratings	Four-monthly
13	Check, inspect, repair, service, replace all missing valves	Six-monthly
14	Replace missing tap handles	As occur
15	Replace missing bath, basin, sink, etc, plugs	As occur

FIRE WATER PIPED RETICULATION NETWORKS

NO	PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Report any failures/breakage of fire fighting equipment to the Engineer	Monthly
2	Replace all valve gaskets, gland packings and seals	Annually
3	Check, inspect, service, repair/replace all non-return valves and backflow preventers	Four-monthly
4	Check, inspect, report and repair all leaks	Monthly
5	Inspect, service, readjust and calibrate all pressure gauges	Four-monthly
6	Paintwork repairs to piping, fittings and equipment	Annually
7	Check, inspect, repair or replace all bracketing systems	Four-monthly

SA 07.02 ELECTRICAL INSTALLATIONS

SA 07.02.01 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

Inspect and repair the following:

- any visible damage to the installation
- setting of protective and monitoring devices

Ensure upkeep of the labelling of the distribution board, equipment, cabling and wiring

Ensure presence of labelling on face plates or bodies of light switches, socket outlets and isolators.

SA 07.02.02 Annual maintenance

Service all luminaires, distribution boards, socket outlets, isolators, light switches, etc.

Witnessed testing of all earth leakage protection units on all socket outlet units.

Visually inspect the following and repair if required:

- Connection of cables and conductors including earthing and bonding.
- Presence of appropriate devices for isolation and switching.
- Correct connection of socket outlets, light switches, isolators, lamp holders, etc.

SA 07.03 FENCING

Maintenance shall include replacing of components, fixing defects, tightening, redressing or any other actions or rectifying measures necessary for complete operation of the fencing installation. This shall include keeping the installation free of litter and any growth or any other element interfering with the function or integrity of the system, 0,5m wide on each side of the fence.

SA 07.03.01 Monthly maintenance

- Clearing the fence route.
- Inspect and repair any visible damages to the installation.
- Corrosion protection on fencing, gates and tubular posts.
- Inspect fence for tightness to straining wire and redress of repair of repair of necessary.
- Inspect tension of straining wires and repair if necessary.

SA 07.04 REFUGE REMOVAL AND PEST CONTROL

The whole of the site within the perimeter fences of the Ports of Entry (as reflected in Specification **SS: Site Specific Information**) shall be kept free of litter, rubble and other solid waste. Litter and rubble (solid waste) shall be collected, stored by the Contractor and removed from the site as frequently as necessary

Removal of household solid waste to the municipal dump site will still be carried out by the Contractor. The cleanliness of the site will be the sole responsibility of the Contractor.

Garden refuse may be amongst the litter and rubble to be collected and disposed off by the Contractor.

The tendered monthly payment for maintenance and site keeping shall be deemed to include to *continuously* collecting litter and rubble across the entire site, placing it in a central solid waste container (skip) and removing it off-site to a formal solid waste facility.

NO	ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Cleaning out of all waste bins in public areas	Daily
2	Cleaning out of all waste bins at residential units	Weekly
3	Collect litter, rubble and other waste across the entire site within the perimeter fences of the Port of Entry and place in central solid waste container (skip)	Continuously
4	Re-fill all rodent bait stations	Monthly
5	Internal pest, termite and rodent control	Monthly
6	External pest, termite and rodent control	Monthly

SA 07.05 CLEANING AND SITE KEEPING

The contractor shall further be responsible for maintaining the grass cutting equipment in a perfect working condition.

SA 07.05.01 Site Keeping

Site Keeping activities will include providing all equipment and consumables necessary for site keeping, such as lawn movers, brush-cutters, rakes, shovels, etc. and shall be deemed included in the monthly maintenance cost for Site keeping and Cleaning.

NO	ACTION	FREQUENCY
1	Cleaning out of *and supply* of black waste bin bags to all waste bins in public areas	Daily
2	Cleaning out of all waste bins in residential areas	Weekly
3	Emptying the solid waste skip and removal of waste off-site to approved dumping site	At least Monthly (when required)
4	Watering of plants, shrubs, grass and trees (*only* if water is readily available and instructed for by Engineer)	Daily

5	Removal of weeds	Weekly
6	Clearing of weeds and grass along the edges of paved areas.	Weekly
7	Cutting of grass. Lawns: *No grass to exceed the length of 40mm.* Open areas: *No grass to exceed the length of 100mm.*	At *least* Monthly (when required)
8	Trimming of dense shrubs	2 Monthly
9	Removal of undesirable shrubs	Quarterly
10	Trimming of trees where branches cause obstruction	Quarterly
11	Collecting of litter and foreign objects	Continuous

SA 07.05.02 Cleaning tasks for Offices, Ablutions and Support Facilities

The Contractor shall be responsible for cleaning ablution facilities as frequently as necessary to maintain them in a clean and healthy condition. The actions outlined below serve only as a benchmark for the cleaning and maintaining of the facilities.

Cleaning activities will include providing all cleaning agents and equipment necessary for cleaning. Consumables such as toilet paper, sanitizers, batteries for sanitizers, bin liners for she-bins, paper towels and hand-wash soap will be replaced by the Contractor as and when necessary and shall be deemed included in the monthly maintenance cost for Site keeping and Cleaning. It can be assumed that toilet paper will be consumed at 3 rolls per toilet per day (single ply), and hand washing soap at 2 litres per soap dispenser per month.

CLEANING TASKS FOR OFFICE AND SUPPORT FACILITIES

	ACTION	FREQUENCY
1	Disinfect and cleaning of floors in public passage areas and open plan offices	Daily (before the opening of the port of entry)
2	Disinfect and cleaning of counter tops and under counter shelves	Daily (before the opening of the port of entry)
3	Emptying of waste baskets in offices and service buildings	Daily
4	Disinfect and cleaning of office floors / Vacuum of carpets	Weekly
5	Washing of windows and dusting of window sills and ledges	Weekly
6	Clean and polish all fittings	Weekly
7	Washing of walls	Monthly
8	Dusting of interior of the building to remove dust and spider webs	Monthly

CLEANING TASKS FOR ABLUTION FACILITIES

	ACTION	FREQUENCY
1	Disinfecting, cleaning and ensuring that the ablution facilities are in a pristine sanitary condition at all times	Continuous 7 days a week
2	Disinfect, washing and cleaning of floors	Continuous 7 days a week
3	Empty and clean all waste receptacles	Continuous Daily
4	Clean and sanitise all bowls, basins and urinals	Continuous Daily
5	Clean, sanitise and polish all fittings and mirrors	Continuous Daily
6	Sanitising and cleaning out of she bins	Continuous Daily
7	Washing of windows and dusting of window sills, ledges, pipes and fittings	Weekly
8	Disinfecting and washing of walls	Weekly
9	Dusting of interior of the building to remove dust and spider webs	Weekly

SA 07.06 WATER DISTRIBUTION NETWORKS

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Water Audit	Monthly
2	Clean out all strainers	Monthly
3	Check, inspect, repair or replace all bracketing systems	Four-monthly
4	Paint repairs to piping, fittings and equipment	Annually

CLEANING OF EXISTING PIPELINES

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Remove silt, debris and loose lime deposits from within pipelines where required by scouring	Annually
2	Do general cleaning in areas where leakage has occurred	Six-monthly

FITTINGS AND STRUCTURES

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Replace all valve gaskets, gland packings and seals	Annually
2	Check, inspect, service, repair and readjust all pressure reducing valves	Annually
3	Check, inspect and test operation of all valves on site	Four-monthly
4	Check, inspect, service, test and repair/replace all safety and expansion release valves	Six-monthly
5	Check, inspect, service, test and repair/replace all air	Four-monthly

	release valves and vacuum breakers	
6	Check, service, repair or replace all ball float valves	Six-monthly
7	Clean out structures of debris	Four-monthly
8	Check, inspect, test, service and repair/replace all non-return valves	Four-monthly

FIRE WATER PIPED RETICULATION STRUCTURES

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Report any failures/breakage of fire fighting equipment to the Engineer	Monthly
2	Replace all valve gaskets, gland packings and seals	Annually
3	Clean out water storage tanks and reseal/repair if necessary	Annually
4	Check, inspect, service, repair/replace all non-return valves and backflow presenters	Four-monthly
5	Check, inspect, report and repair all leaks/replace rotten pipes where required	Monthly
6	Inspect, service, readjust and calibrate all pressure gauges	Four-monthly
7	Paint repairs to piping, fittings and equipment	Annually
8	Check, inspect, repair or replace all bracketing systems	Four-monthly

SA 07.07 WATER RESERVOIRS AND PRESSED STEEL TANKS

NO	ROUTINE PREVENTATIVE MAINTENANCE OF PRESSED STEEL TANKS AND ANCILLARIES	MAINTENANCE FREQUENCY
1	Check for and repair all leaks. Repair leaks.	Monthly
2	Corrosion protection.	Annually
3	Clean and sterilise pressed steel tank.	Annually

SA 07.08 BOREHOLE PUMP SYSTEMS

All borehole pumping equipment and systems shall be serviced and maintained to keep it in perfect functional condition.

NO	ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Service submersible pumps	Annually
2	Clean filters/strainers	Three-monthly
3	Check V-belts	Monthly
4	Measure rest water-level	Three-monthly
5	Check and clean MCC panel	Three-monthly
6	Check electric motors	Monthly
7	Monitor supply to storage tanks from borehole and other sources	Daily

SA 07.09 WATER PUMP SYSTEMS

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

NO	ROUTINE PREVENTATIVE MAINTENANCE OF CLEAR-WATER PUMP SYSTEMS	MAINTENANCE FREQUENCY
1	Check, service, repair and clean all pumps	Six-monthly
2	Corrosion protect pumps, motors and surface piping	As required
3	Check, inspect, report and repair all leaks	Monthly
4	Check and lubricate moving parts	Four-monthly
5	Operation and maintenance of pump for water supply to Bulk tank at Monantsa Pass Port of Entry	Daily

SA 07.10 SEWERAGE NETWORKS

SA 07.10.01 Sewerage Network System

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Check, inspect, repair or replace all manhole covers and frames and builder's work to manholes	Four-monthly
2	Check, inspect and repair manhole benching.	Four-monthly
3	Check, inspect, repair or replace all inspection eye, end caps and cleaning eye covers	Four-monthly
4	Check, inspect, report and unblock any blockage that occurs	Monthly
5	Systematically mechanical cleaning of all sewer manholes and unblocking of all sewer lines	Monthly
6	Check, inspect, repair/replace sewer pipes where necessary to maintain good working condition at all times	Four-monthly

SA 07.11 WASTEWATER PUMP SYSTEMS

NO	ROUTINE PREVENTATIVE MAINTENANCE OF WASTEWATER PUMP SYSTEMS	MAINTENANCE FREQUENCY
1	Check and clean all pumps	Monthly
2	Corrosion protect pumps, motors and surface piping	Annually
3	Check, inspect, report and repair all leaks	Monthly
4	Check and lubricate moving parts	Four-monthly

SA 07.12 ROADS

All components of the roadway infrastructure, which includes the road surface, underlying layer works, kerbing, road markings, road signs and sidewalks, shall be maintained during the Contract.

Maintenance shall include all repair work, replacing of components, fixing of defects, or any other actions or rectifying measures necessary for complete and safe functioning of the road infrastructure.

Maintenance of the road infrastructure shall also include all other actions related to maintenance, such as temporary accommodation of traffic through and around work areas, and provision of temporary accesses to properties.

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Check, inspect, repair all surface failures	Two-monthly
2	Check, inspect, repair all pavement failures	Six-monthly
3	Inspect and repair gravel shoulders	Six-monthly
4	Check, inspect, repair road signs	Six-monthly
5	Check, inspect, repair, repaint, replace road markings	Annually
6	Remove loose material from the surface of parking areas by means of mechanical brooming	Monthly

SA 07.13 STORMWATER DRAINAGE

All components of the stormwater drainage infrastructure, including surface as well as underground components, shall be maintained during the Contract.

Maintenance shall include all repair work, replacing of components, fixing of defects, cleaning, or any other actions or rectifying measures necessary for complete and safe functioning of the stormwater drainage infrastructure.

Maintenance on the stormwater drainage infrastructure shall also include all other actions related to maintenance, such as temporary drainage features and temporary accommodation of traffic.

NO	ROUTINE PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Check, inspect, repair or replace all manhole or inlet covers, grids and frames and builder's work to manholes.	Four-monthly
2	Check, inspect and repair manhole and inlet benching.	Four-monthly
3	Check, inspect, report and unblock any blockage that occurs.	Monthly
4	Clean all vegetation and debris accumulated in inlets and stormwater pipes / culverts.	Monthly

SA 07.14 EXTERNAL LIGHTING SYSTEMS

Maintenance shall include all repairs, replacing of components or materials, routine setting or any other actions necessary to ensure a perfect functional condition. The following shall be used as guidelines to ensure effective maintenance:

SA 07.14.01 Area Lighting

Monthly Maintenance

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

Annual Maintenance

- Service all luminaires
- Measure earth resistance of electrode
- Measure earth resistance of trench earth
- Record values in record book

SA 07.14.02 Security Lighting

Monthly Maintenance

- Verify operation of switching element.
- Check lamps.
- Check that all pole covers are secure.
- Visually check distribution kiosk.

Annual Maintenance

- Measure phase voltages and line currents in distribution kiosk or local distribution board.
- Do vermin protection.
- Service all luminaires.
- Paint timber poles with creosote.

SA 07.14.03 Street Lighting

Monthly Maintenance

- Verify operation of switching element.
- Check lamps.
- Check that all pole covers are secure.
- Visually check distribution kiosk.

Annual Maintenance

- Measure phase voltages and line currents in distribution kiosk.
- Do vermin protection.
- Service all luminaries and distribution kiosks.
- Paint timber poles with creosote.

SA 07.15 LOW VOLTAGE RETICULATION

SA 07.15.01 Monthly maintenance

- Verify operation of volt and ammeters.
- Check that access covers are secure.
- Visually check distribution board.
- Check all connections.
- Check operation of switching timers.
- Inspect and secure access doors and covers.
- Inspect distribution kiosks.
- Inspect overhead conductors, insulators and poles.
- Monthly electricity meter readings

SA 07.15.02 Annual maintenance

- Service all low voltage boards.
- Measure phase voltages and line currents in low voltage distribution board.
- Record values in record book and Maintenance Control Plan.
- Service all distribution and metering kiosks
- Service overhead distribution system.

SA 07.16 STANDBY POWER SYSTEMS

SA 07.16.01 Weekly maintenance

1. Simulate a power failure **EVERY FRIDAY** at **11:00** to ensure generator is fully operational. Test run shall be undertaken, if possible on load, and running hours, diesel levels, volt, ampere and frequency readings recorded.

SA 07.16.02 Monthly maintenance

1. 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.

2. Verify that alarm functions are operational by simulation:

    - low oil pressure.
    - high engine temperature.
    - low engine coolant level.

- abnormal speed.
- synchronising failure (if applicable)
- cooling water pump failure.
- cooling tower fan failure (if applicable).
- low battery voltage.
- low fuel day tank.
- fuel pump failure.
- low fuel bulk tank (if applicable).

3. 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

4. Alternator shall be checked for accumulation of dust on the regulator and for any loose components.

5. Test run shall be undertaken, if possible on load, and volt, ampere and frequency readings recorded.

6. Alternator shall be cleaned and switched back into 'auto' mode.

7. Complete Standby Generator monthly log sheets

8. Record running hours, diesel consumption etc in the following prescribed format:

	Previous Measurement	This Measurement	Consumption	Average per day
Date:	01-Apr-16	03-May-16	Total	32 days
Diesel Tank Meter Reading (litres)	26542.2	30546.2	(liters) 4004.0	(ltrs/day) 125.1
Running Hours:			(hours)	(hrs/day)
Generator 1 (hrs)	1245.6	1604.2	358.6	11.2
Generator 2 (hrs)	2535.6	2927.6	392.0	12.3
Total Generator Hours (hrs)			750.6	
Average Diesel consumption			5.3	ltrs/hr

SA 07.16.03 Annual maintenance

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

1. Drain an oil sample and submit for analysis to establish need for an oil change. Fix test report in Record book.
2. Record output parameters while on load.
3. Record running hours.
4. Replace oil and fuel filters (if not replaced during 1 year as part of 200hrs service)
5. The cooling system shall be drained, flushed and refilled with water and prescribed water conditioner.

SA 07.17 HEATING, VENTILATION AND AIR-CONDITIONING SYSTEMS

SA 07.17.01 Monthly maintenance

REFERENCE NUMBER	ACTION
S-1	Clean filters, replace if required
S-2	Inspect air intake and discharge for blockages
S-3	Check all refrigerant, drainage pipes for damaged and leaks
S-4	Check sight glass: clear or flash gas
S-5	Carry out visual inspection of condenser coil for blockages and correct operation of fans
S-6	Carry out visual inspection of evaporator coil for blockages and correct operation of supply fan
S-7	Check enclosure for damages
S-8	Check electric motor running temperatures
S-9	Check electric connections for tightness
S-10	Test thermostat and control operation
S-11	Clean condensate tray and test drainage for proper operation
S-12	Check cooling and heating cycle

SA 07.17.02 Bi-Annual maintenance (6-monthly)

REFERENCE NUMBER	ACTION
S-1	Clean filters, replace if required
S-2	Inspect air intake and discharge for blockages
S-3	Check all refrigerant, drainage pipes for damages and leaks
S-4	Check sight-glass: clear or flash gas
S-5	Carry out visual inspection of condenser coil for blockages and correct operation of fans
S-6	Carry out visual inspection of evaporator coil for blockages and correct operation of supply fan
S-7	Check enclosure for damages
S-8	Check electric motor running temperatures
S-9	Check electric connections for tightness
S-10	Test thermostat and control operation
S-11	Clean condensate tray and test drainage for proper operation
S-12	Check filter/dryer
S-13	Check superheat and functioning of expansion valve
S-14	Check operation of HP and LP switch
S-15	Check operation of controllers
S-16	De-rust, neutralize and touch up paint work
S-17	Check cooling and heating cycle
S-18	Clean evaporator and condenser coil chemically
S-19	Clean all filter frames and seals
S-20	Check fan motor and compressor current
S-21	Check and test overload settings
S-22	Lubricate all bearings

SA 07.18 FIRE FIGHTING EQUIPMENT

The routine preventative 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.

SA 07.18.01 Fire Hydrants: Monthly Maintenance

- Check hydrant valve seal.
- Check right hand wheel for tightness.
- Check valve stem and or top for damage.
- Check valve stem seal and readjust.
- Check operation of quick couplers.
- Check operation (opening and closing movement of valve).
- Check water pressure and flow.
- Check stand pipe for rigidness and leaks.
- Log maintenance schedule.
- Report defects for processing and repair.

SA 07.18.02 Fire Hose Reels: Monthly Maintenance

- Check drain seal.
- Roll down hose and check for cracks or perishing.
- Check operation of PWD type nozzle.
- Check operation of drain.
- Check operation of fire hose reel valve.
- Lubricate moving parts of drum.
- Check pressure and flow of fire hose reel.
- Check piping for leaks and damages.
- Log maintenance schedules.
- Report defects for processing and repair.

SA 07.18.03 Fire Extinguishers: Monthly Maintenance

- Check charge of the extinguisher.
- Check the condition of the discharge.
- Check the mechanism condition of the discharge hose.
- Update the log entry on the extinguisher.
- Log maintenance schedule.
- Report defects for processing and repair.
- DCP extinguishers: Check charge and replace powder at prescribed intervals.
- CO_2 extinguisher: Check charge.

SA 07.18.04 Jockey Pump

Monthly maintenance responsibilities:

- Visually inspect and report on complete pump and motor
- Test pump for 30 minutes
- Check manual start
- Check auto start
- Listen for unusual noises and vibration

- Keep the machine clean and ensure free ventilation air-flow
- Check the condition of connections and mounting and assembly bolts
- Inspect bearings for lubrication

SA 08 MANDATORY PERIODICAL SERVICES

The following mandatory periodical services shall be measured for payment separately and does not form part of the remuneration for monthly preventative maintenance items.

SA 08.01 Log all water meter readings and calculate losses on a monthly basis and report in the following format:

	Previous Measurement	This Measurement	Consumption	Average per day (kl)
Date:	01-Apr-16	03-May-16	Total	32 days
WATER SUPPLY: (kl)			(kl)	(kl/day)
Main Supply (Input)	278540.6	279235.5	694.9	21.716
Admin	15642.0	15690.0	48.0	1.500
Cell Block	15674.0	15721.5	47.5	1.484
House A1	18569.5	18610.8	41.3	1.291
House A2	32598.0	32650.5	52.5	1.641
House B1	13359.4	13396.0	36.6	1.144
House B2	89562.5	89620.7	58.2	1.819
House B3	98685.3	98721.1	35.8	1.119
Ablution A	85684.0	85723.2	39.2	1.225
Ablution B	53265.5	53397.6	132.1	4.128
Building A	25689.2	25790.2	101.0	3.156
Building B	26858.8	26952.1	93.3	2.916
Total consumption (Output)			685.5	21.422
Loss (Input - Output)			9.4	0.294
POTABLE WATER SUPPLY:				
Water supply within standards	Yes/~~No~~	Yes/~~No~~		
Water test report attached	Yes/~~No~~	Yes/~~No~~		

SA 08.02 Sample potable water supply and chemical analyses to be provided by an authorised company on a monthly basis. The water report should be provided in the following format, **in accordance with SANS241**:

SANS 241:2006	Unit	Class 1 (recommended values)
Chemical report		
pH		5.5 tot 9.5
Electrical conductivity	mS/m	150
Calcium as Ca	mg/L	150
Magnesium as Mg	mg/L	70
Sodium as Na	mg/L	200
Potassium as K	mg/L	50
P-Alkalinity	mg/L	
M-Alkalinity	mg/L	
Fluoride as F	mg/L	1
Chloride as Cl	mg/L	200
Bromide as Br	mg/L	**3
Nitrate as N	mg/L	10
Phosphate as PO_4	mg/L	
Sulphate as SO_4	mg/L	400
Calcium Hardness	mg/L	375
Magnesium Hardness	mg/L	287
Total Hardness as $CaCO_3$	mg/L	662
Total Dissolved Solids	mg/L	1050
Aluminium as Al	mg/L	0.300
Arsenic as As	mg/L	0.010
Chromium as Cr	mg/L	0.100
Copper as Cu	mg/L	1.000
Iron as Fe	mg/L	0.200
Manganese as Mn	mg/L	0.100
Lead as Pb	mg/L	0.020
Zinc as Zn	mg/L	5.000
Bacterial report		
Heterotrophic plate count	cfu/ml	100
Total coliform	cfu/100ml	0
E. coli	cfu/100ml	0

SA 08.03 Log all electricity meter readings on a monthly basis and report in the following format:

	Previous Measurement	This Measurement	Consumption	Average per day (kl)
Date:	01-Apr-16	03-May-16	Total	32 days
ELECTRICITY: (kWh)			(kWh)	(kWh/day)
Main Supply	124899.0	145865.9	20966.9	655.2
Admin	1356.0	1523.3	167.3	5.2
Cell Block	3596.5	3658.2	61.7	1.9
House A1	8976.0	9256.3	280.3	8.8
House A2	9686.0	9785.2	99.2	3.1
House B1	9565.0	10152.3	587.3	18.4
House B2	3594.0	4512.3	918.3	28.7
House B3	3594.0	4689.2	1095.2	34.2
Ablution A	3598.0	4154.8	556.8	17.4
Ablution B	5975.0	8754.3	2779.3	86.9
Building A	5698.0	8520.0	2822.0	88.2
Building B	5689.0	8654.2	2965.2	92.7

SA08.04 Cleaning and sterilization of water storage reservoir/tank to be performed annually.

SA08.05 Blade all gravel roads and parking areas every six months

SA08.06 Remove and empty waste from skip to external waste disposal site on a weekly basis.

SA08.07 De-sludge and cleaning of septic tanks as and when required and instructed for by the Engineer.

SA08.08 Service submersible pumps for borehole installations annually

SA08.09 Service sewage pumps for wastewater installations annually

SA08.10 Supply of Chemicals for dosing equipment at the Water Treatment plant as required

SA08.11 Statutory annual servicing of fire extinguishers.

SA08.12 Statutory annual servicing of fire hose reels.

SA08.13 Statutory annual servicing of fire hydrants.

SA08.14 Annual Pest control (internal and external)

SA 09 FREQUENT SERVICING OF INSTALLATIONS

SA 09.01 Wastewater Treatment Works

General frequent servicing of the wastewater treatment works shall be done in accordance with this specification..

SA 09.01.01 General

The general frequent servicing work to be performed and executed shall include, but shall not be limited to the items listed in the table below.

Item	Description	Frequency
01	General housekeeping: Keep site in neat and acceptable condition.	Daily
02	Control access to the site.	Daily
03	Maintain safety conditions on site.	Daily
04	Log and report spills, pollution events, power failures, extraordinary process phenomena, etc. Check auto-reset of power to mechanical equipment.	Event
05	Develop a feel for effective treatment by means of visual indicators of good/bad plant performance: Colour, odour, foam, algae growth, aerator spray patterns, effluent clarity, bubbles, floating material, solids accumulation, flow patterns, turbulence, touch.	Daily
06	Record operating hours and kW-hours of all mechanical equipment.	Daily
07	Check operation of all valves and sluices.	Monthly

SA 09.01.02 Specific Processes and Units

The specific frequent servicing work to be performed and executed shall include, but shall not be limited to the items listed in the table below.

Item		Operation of Specific Processes and Units	Frequency
01		Septic tanks and French drains	
	01	Check and log scum, water and sludge depths in tank.	6 Months
	02	Empty tank at specified frequencies (max. 3 years) or when full.	3 Years
	03	Inspect French drain for accumulation of water or for seepage to surface. If positive, repair drain.	3 Months
	04	Clean connecting pipes and accessories and remove tree and grass roots from pipes.	3 Months

SA 09.01.03 Monitoring and Reporting

The contractor shall keep a written record of all measurements taken and analyses done for process control and for reporting to relevant authorities in terms of legal or project requirements.

A logbook shall be kept for daily recording of failures, malfunctions, spills, pollution events, power failures and detail of measures taken.

SA 09.02 Water Treatment Works

General operation of the water treatment works shall be done in accordance with this specification, with Additional Specification SF: General Operations.

SA 09.02.01 Daily Actions

- Check that the raw water valve is open
- Check that the chemical dosing pumps are working correctly
- Check dosing rates
- Check all valve positions
- Check that all feed pumps are running without vibration
- Check control panel for any alarm
- Make-up chemicals if required
- Check pressure gauges for normal reading
- Check pH- & Chlorine readings, and record
- Record flow-meter readings

SA 09.02.02 Weekly Actions

- Perform all daily checks as stated above.
- Clean out the strainer in chlorine feed-line
- Clean out plant room
- Check chemical stock (re-order if additional chemicals are needed)
- Check pump rotation and action accordingly

SA 09.02.03 Monthly Actions

- Perform all daily checks as stated above.
- Perform all weekly checks as stated above.
- Clean dosing system
- Check sand filter media
- Shut-down plant for at least 4 hours and de-sludge clarifiers manually (for at least 30 seconds each)
- Check corrosion, record and take corrective action

SA 09.02.04 Yearly Actions

- Perform all daily checks as stated above.
- Perform all weekly checks as stated above.
- Perform all monthly checks as stated above
- Check sand filter media levels and top-up hydro anthracite if needed
- Check all electrical connections for tightness and corrosion on all terminals
- Replace dosing pump diaphragms

SA 10 MEASUREMENT AND PAYMENT

SA.01 **Maintenance of an installation** .....Unit: point

The unit of measurement shall be a point. Each month shall represent a maximum of ten points and a minimum of zero points, depending on the performance and quality of maintenance. Ten points per month at the tendered rate shall include full compensation for the complete monthly maintenance of an entire installation and all appurtenant works deemed to form part thereof, as defined in the relevant Specifications.

Ten points per month at the tendered rate shall also include full compensation for complete preventative, corrective and breakdown maintenance (as defined in this General Maintenance Specification), including full compensation for all costs related to resetting, repair, procurement, supply, delivery, replacement, protecting, furnishing, installing, testing and commissioning of all items and material required to maintain the complete installation in a perfect functional condition. The only items not to be included in the rate for monthly maintenance points are:

1. Supply, delivery, installation and testing of special equipment/materials that will be measured elsewhere, and
2. Special testing of an installation.
3. Call-Out cost for emergency breakdown visit (if applicable - measured separately)
4. *Statutory Periodical Services as described and listed in paragraph SA 08 of this specification.*

Different installations shall be listed in the Bill of Quantities, in accordance with the definition of each installation.

Although ten points per month shall include full compensation for routine preventative, corrective and breakdown maintenance, the Contractor might fail to achieve all points applicable in the event of unsatisfactory performance, in which case he shall still perform all maintenance requirements according to specification, but at his own cost where a reduction in points awarded is insufficient to cover his cost.

SA.02 **Payment reduction due to exceeding of maximum allowable down-time during emergency breakdown**..... ...Unit: hours

The unit of measurement shall be the number of hours, *in excess of **12 hours***, during which a component of an installation was in a dysfunctional condition that required emergency repairs.
The negative fixed rate shall include full compensation for the User Client's loss in productivity and, multiplied by then umber of hours measured, shall be deducted from the certified amount due to the Contractor.

SA.03 **Payment reduction due to exceeding of maximum allowable down-time during ordinary breakdown** ....Unit: days

The unit of measurement shall be the number of days, *in excess of **4 days***, during which a component of an installation was in a disfunctional condition that required ordinary repairs.

The negative fixed rate shall include full compensation for the User Client's loss in productivity and, multiplied by the number of days measured, shall be deducted from the certified amount due to the Contractor.

SA.04 **Payment reduction due to exceeding of maximum allowable down-time during damage breakdown**..... Unit: days

The unit of measurement shall be the number of days, *in excess of* ***7 days***, during which a component of an installation was in a disfunctional condition that required ordinary repairs.

The negative fixed rate shall include full compensation for the Client's loss in productivity and, multiplied by the number of days measured, shall be deducted from the certified amount due to the Contractor.

SA.05 **Call-Out for repair of Emergency Breakdown**..... Unit: No

The Unit of measurement shall be number. The Contractor will be remunerated for the number of call-out trips to the site, in order to attend to the repair of an *emergency breakdown* logged with him by the Engineer. The tendered rate shall provide full compensation for all travel, accommodation and travel-time cost to and from the site. Remuneration for material and labour cost is deemed to be included under the "maintenance of an installation" payment item in the schedule of quantities, based on the points system and measured monthly.

SA.06 **Maintenance Control Plan**..... Unit: site

The Unit of measurement shall be site for which a Maintenance Control Plan has been developed and approved as described in SA 04.02.

SA.07 **Site Maintenance Record Keeping**..... Unit: month

The Unit of measurement shall be month for each site for which the Maintenance Control Plan has been updated with all site maintenance record keeping, reports, checklists, schedules and forms as described in SA 03.10.

SA.08 **Update Existing and Supply Complete Key Plan**..... Unit: site

The unit of measurement shall be for each complete colour set (**three** colour A0-size copies) of the key plan(s) as well as 'dxf' or 'dwg' electronic format on CD. The existing key-plans shall be provided to the contractor in electronic format (similar to the key-plans contained in this document).

The tendered rate shall include full compensation for all expenses such as paper, copy work and printing required for the completion of the key plan.

The key plan shall include and comply with the following:

(a) Detail ground survey

All services must be shown on a complete key plan as required by the Engineer, including roads, stormwater inlets and pipes, fences, paving, transmission lines, transformers, sewerage lines, water distribution networks, pump stations, fire fighting equipment, street lighting and air-conditioning etc. For sewerage reticulation, water reticulation and stormwater drainage systems the pipe sizes and types, as well as invert heights must be provided. An effort must be made to trace the routes of these services.

(b) Survey of buildings
The "footprint" of **all the buildings and structures** must be surveyed.

(c) General
All survey data shall be captured in electronic format (DXF or DWG). Drawings shall be drawn to scale.

SA.08.01 TITLE BLOCK

The standard drawing sheet layout and title block of the Department of Public Works must be used.

Complete all the relevant fields in the title block with reference to the name of the Port of Entry in the appropriate block. The words KEY PLAN should form part of the drawing title.

Drawing Number

The drawing number should consist of a three-part identifier:

- Port of entry designator: WCS 045305
- Drawing number: Numbering will start at 1
- Revision number:Will start at 01

Typical example: WCS 045305/1 Rev 01

Overlay Sheets/Layering Scheme

The overlay sheet designator identifies the type of drawing (example: overlay for water reticulation) and can be added to the drawing number:

- C: Existing structures, facilities, roads, paving, fencing, etc
- CR: Stormwater drainage system
- CE: Electrical power and equipment
- CF: Fire fighting equipment
- CS: Sewer network
- CT: Telephone lines
- CW: Water reticulation system

Typical example for the numbering of an overlay sheet:
WCS 045305/1**CW** Rev 01

SA.08.02 DRAFTING CONVENTIONS

The Key Plan should be created following engineering conventions and standards in order to represent a clear drawing simplifying the huge amount of visual information.

Paper Prints

Preference is given to size A1 plans, but for reporting size A3 will be used and the information should still be legible in this format.

Scale

The Key Plan must be drawn according to scale and the following scales can be used:

- 1:200 or 1:500 or 1:1000

Plan Orientation

The Port of Entry should be rotated on the plan so that the north point arrow are pointing in the direction of either the upper left or upper right quadrants of the plan. The north point arrow to be placed in the top right hand corner of the drawing space.

Contours

Contours should not be printed on the final Key Plan.

Line Weight

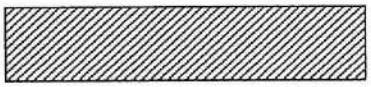
Line weight/width is extremely important and features such as the services should be drawn with lines that are more prominent. The following line weights (mm) can be used:

1.	0.10	5.	0.35
2.	0.15	6.	0.50
3.	0.25	7.	0.70
4.	0.30	8.	1.00

Line Type/Style

The following typical standard line types that can be used:

TYPICAL LINE TYPES

LINE DESCRIPTION	LINE APPEARANCE
1. Centre Line	
2. Solid/Continuous line	
3. Short broken line	
4. Long broken line	
5. Break line	
6. Hatch lines 45°	

Hatching

Hatching are angled line patterns to indicate the position of permanent structures. The spacing between lines should be consistent at 45° to the structure. Park Homes must be shown on the plan, but without hatching.

Surfaced Areas

Surfaced roads should be indicated by two solid lines as well as paved areas.

Two long broken lines should be used to indicate gravel roads.

Non Standard Line Types

The following lines could be used for the various services, but must be identified in the Legend as a non standard line type:

NON STANDARD LINES (OPTIONAL)

LINE DESCRIPTION	LINE APPEARANCE
1. Electrical power line	——— E ——— E ———
2. Electrical power cable	——— C ——— C ———
3. Stormwater pipe	——— R ——— R ———
4. Sewerage pipe	——— S ——— S ———
5. Telephone line	——— T ——— T ———
6. Water pipe	——— W ——— W ———
7. Fence line and gate	1.8 m ——— x ——— x ———⋈

Lettering and Font Styles

Use the standard font style and font size for engineering drawings and do not use stylized fonts.

Create all text in upper case letters, except for certain unit designations such as km, m, mm, kVA, etc.

Key Layout

When the Port of Entry is too large for one sheet, divide the plan into logical sections. Add a key layout in the title block showing how the various sheets should be joined together to obtain a layout of the entire site. This key layout should form part of each sheet.

Facilities

The name of the facility should be written inside or adjacent to the facility. If the space is limited, a reference number of the facility, which refers to a description of the facility, is inserted in a table format in or close to the title block.

Fences and gates

Show the position of the security fence and all other fences as well as gates. Include the height of all fences.

Destinations

The destination to the nearest town with a pointing arrow should appear on all incoming and outgoing roads.

SA.08.03 SERVICES

The position of the services is extremely important and should be indicated by lines that are more prominent/thicker. The description of the line types for the various services must be given in the Legend.

The following services, where applicable, must be shown on the Key Pan for future reference:

Water Reticulation System

Show the position of the water reticulation system and include the following:

- Pipe lines, pipe sizes, type of pipes, valves, meters, boreholes and tanks (include capacities). Show the direction of flow.

Sewerage Network

Show the layout of the sewerage network and include the following:

- Pipe lines, pipe sizes, type of pipes, manholes, rodding eyes, septic tanks (include capacities), french drains (include volumes). Show the invert levels of all manholes as well as the position and level of the bench mark.

Electrical Power

Indicate the position of electrical power lines, cables, substations, kiosks, flood lights along the perimeter as well as street lights and area lighting.

Air-conditioning units should be numbered and listed in table format including the type and size.

Give the source(s) of electrical power.

Telephone Lines

Show the position of overhead telephone lines.

Stormwater System

Show the layout of the stormwater system, culverts and sizes as well as inlet and outlet structures. Give the invert levels of all structures as well as the position and level of the bench mark.

Fire Fighting Equipment

Include the pump installation, tank and capacity, fire hydrants, valves, meters, fire extinguishers and fire hose reels.

Fire extinguishers should be numbered and listed in table format including the type and size.

SA.08.04 ELECTRONIC FORMAT

A complete set of electronic files shall be placed on CD(s) in a Data Exchange Format (DXF) or DWG format.

Affix a stick-on label to the CD with the following information:

- Department of Public Works and logo
- Name of Port of Entry
- WCS number
- Description: KEY PLAN
- Drawing number(s)
- Date issued
- Electronic format: DXF or DWG

Also refer to the table below: **Site Key Plan: Drawing Specifications** for detail regarding required services, formats and settings.

SA.09 Contingency allowance for Operational Damages..... Unit: PC Sum

The contractor shall be required to repair/replace all defects/damages logged at the National Call Centre as 'MALICIOUS DAMAGE' as defined in section SA 06.02 (based on ruling by Engineer), ***and*** instructed for by the Engineer, for which payment shall be made under this item after approval of quotation by the Engineer, prior to any work being done. The PC Sum amount shall be for direct costs only based on approved documentation provided to the Engineer. All profits, attendance, travelling, labour, mark-up, accommodation and time-cost should be added as the percentage charge required by the Contractor on sub-item provided for in the bills of quantities.

DEPARTMENT OF PUBLIC WORKS
PREVENTATIVE MAINTENANCE SCORE-CARD

CONTRACT NUMBER: WCS _____

CONTRACT: _____

CONTRACTOR: _____

ENGINEER: **Ukhukhula Consulting Engineers (Pty) Ltd**

INSTALLATION: _____ **MONTH**: ☐☐ OF **36**

The following components of the installation were selected by the contractor at the Monthly Maintenance Meeting nr. ☐☐ as performance indicators to be tested according to specification:

1. CONTRACTOR'S SELECTION	**0**	**1**
1.1 _____		
1.2 _____		
1.3 _____		
1.4 _____		
1.5 _____		
SUBTOTAL:		

The following components of the installation were selected by the Engineer as performance indicators to be tested According to specification:

2. ENGINEER'S SELECTION		
2.1 _____		
2.2 _____		
2.3 _____		
2.4 _____		
2.5 _____		
SUBTOTAL:		

TOTAL SCORE: ☐☐

_____ _____ D D / M M / Y Y

Engineer's Representative **Signature** **Date**

GUIDELINE FOR THE USE OF THE PREVENTATIVE MAINTENANCE SCORE-CARD

The score-card and performance indicators must be used as a maintenance management tool. The aim with each score-card is to ensure that:

(a) the project focuses on key aspects of maintenance per month;
(b) the Contractor receives payment for his work, and
(c) the Employer receives value for money and a sustained high level of service.

Performance indicators must be selected to measure the Contractor's service level of routine preventative and corrective maintenance that will be based on the Maintenance Control Plan, the specifications and the Operating and Maintenance Manuals (containing information specified in the Contract documentation).

For each specific installation, different performance indicators must be defined each month based on the content of the maintenance in relation to the scope of maintenance work per installation and must be based on the Contractor's service level record on routine preventative and corrective maintenance.

Breakdown maintenance is excluded from the score-card's scope of measurement. Breakdowns must be dealt with if and when necessary by logging of the breakdown and monitoring the downtime.

The Contractor and the Engineer must agree on all performance indicators at an occasion prior to the month during which the Contractor's performance (service level of maintenance) will be measured.

ADDITIONAL SPECIFICATION

SB OPERATING AND MAINTENANCE MANUALS

CONTENTS

SB 01 SCOPE

The Contractor shall be responsible for the compilation and updating of complete sets of Operating and Maintenance Manuals. A separate Operating and Maintenance Manual shall be supplied for each installation where required and as defined in the Additional Specification SA: General Maintenance.

SB 02 PROCEDURE FOR SUBMISSION OF MANUALS

SB 02.01 SUBMISSION OF DRAFT MANUALS

A draft copy of each Operating and Maintenance Manual shall be submitted to the Engineer prior to safety inspection of the installation. Approval of the draft Operating and Maintenance Manuals shall be a prerequisite for commencement of the safety inspection in terms of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)

Where and installation has an existing Operating and Maintenance Manual, the Contractor shall check whether its contents are still applicable and accurate. When drawing up a new Operating and Maintenance Manual for the installation, the Contractor shall incorporate all such existing applicable data. The existing Operating and Maintenance Manual shall then be replaced provided written permission to do so has been obtained from the Engineer.

The manuals will be reviewed and checked by the Engineer and returned to the Contractor with comments, where necessary. The Contractor shall make the necessary changes and amendments to the manuals to incorporate the Engineer's comments.

SB 02.02 DEVELOPMENT OF FINAL MANUALS

A final draft copy of each Operating and Maintenance Manual shall be submitted to the Engineer at least one week prior to commencement of Day 1 tests on commissioning. This set of manuals will not be accepted without the Contractor's verification of the information contained in the manuals and the professional language

editing thereof. The Engineer shall return the manuals to the Contractor, who shall make the final corrections. The Engineer will, however, not be responsible for the quality control on manuals. Approval of final Operating and Maintenance Manuals shall be a prerequisite for issuing of a Certificate of Practical Completion for repair of the installation.

After the Engineer has approved the final Operating and Maintenance Manuals, the Contractor shall provide the Engineer with seven (7) sets of the manuals. Approval of the final Operating and Maintenance Manuals shall be a prerequisite for issuing of a Certificate of Completion.

SB 03 FORMAT OF OPERATING AND MAINTENANCE MANUALS

(a) Manuals shall be bound in hardcover lever-arch files with plastic coatings. The files shall be clearly labelled on the front cover, as well as on the back band, with the following information:

  (i) The title "Operating and Maintenance Manuals"

  (ii) Name of the installation (as defined in Additional Specification SA: General Maintenance)

  (iii) Name of the contract and contract number

  (iv) The Contractor's name, address and contact telephone number and fax (logo optional)

  (v) Month and year in which the manuals are finally handed over to the Employer

  (vi) Name of the User Client

(b) Pamphlets and bound leaflets/booklets from suppliers or manufacturers shall be placed in plastic pockets.

(c) Drawings and diagrams larger than A3 shall be folded and placed in plastic pockets to be easily removed or stored.

(d) The sections of the manuals specified below shall be clearly partitioned.

(e) Cross-referencing between drawings/diagrams and text shall be in a clear and consequent format.

(f) The Operating and Maintenance Manuals shall be supplied in English.

(g) An electronic copy of the final manual shall be handed to the engineer upon approval of the operation and maintenance manual.

SB 04 CONTENTS

SB 04.01 TABLE OF CONTENTS

The table of contents shall appear on the second page and shall consist of the headings of the various sections in the manual and the relevant page numbers.

The table of contents shall essentially contain at least the following:

1. Introduction
   - 1.1 Scope of the manual
   - 1.2 General arrangement of the manual
   - 1.3 Description of installation
   - 1.4 Specifications
2. List of drawings and diagrams
3. Parts and components
4. Operating procedures
5. Maintenance
   - 5.1 Purpose of maintenance
   - 5.2 Preventative maintenance
   - 5.3 Trouble-shooting
6. Breakdown maintenance and repair
7. List of Appendices.

SB 04.02 INTRODUCTION

The introduction shall contain at least the following:

SB 04.02.01 Scope of the manual

A summary shall explain the scope of the contents.

SB 04.02.02 General arrangement of the manual

A brief description shall explain the way in which the manual is arranged.

SB 04.02.03 Description of installation

This section shall give a functional description of the complete installation covered by the manual, including all systems and/or functional units deemed to form part thereof, as defined in Additional Specification SA: General Maintenance.

SB 04.02.04 Specifications

A summary shall be given of the specifications applicable to the particular part of the Contract.

SB 04.03 DRAWINGS AND DIAGRAMS

SB 04.03.01 Mechanical flow diagrams (MFDs) and single line diagrams

Mechanical flow diagrams (for mechanical systems) or single line diagrams (for electrical systems) of the system and/or functional unit shall be included in the Operating and Maintenance Manuals for easy reference by the operators of the installation. Diagrams shall be drawn not only for parts of an installation that have been repaired, but also for the complete installation, including all the components.

SB 04.04 PARTS AND COMPONENTS

SB 04.04.01 Equipment data sheets

A data sheet shall be drawn up for each piece of equipment and/or machine forming part of the installation and shall contain the following information:

(a) Equipment tag number
(b) Equipment description
(c) Model/make/manufacturer
(d) Supplier/Reconditioning details
(e) Ordering details
(f) Details of fixed components
(g) Details of lubrication
(h) Maintenance references (refer to supplier/reconditioning technical manual).

SB 04.04.02 Technical equipment manuals

For each piece of equipment and/or machine forming part of the installation the following information shall be included in this section of the Operating and Maintenance Manuals:

(a) the supplier or reconditioning manual and/or standards of operating and maintenance instructions;

(b) illustrated parts breakdown and/or group assembly drawings as agreed with the Engineer;

(c) parts lists and data sheets, including all characteristic curves for machines indicating operation point, efficiency, power consumption, etc;

(d) calibration charts, and

(e) test certificates for hydraulic pressure tests, flame-proof grading, materials, non-destructive examinations, coating and lining details, etc.

Each detailed description shall be accompanied by a set of engineering drawings. From the drawings the functionality of each part or component used, as well as the special characteristics associated with the part or component shall be very clear.

SB 04.04.03 Parts and components list

A detailed description shall specify all the parts and components used for the duration of the Contract. This description shall include new parts and components, as well as existing parts and components that have either been reconditioned or used as specified in the Contract.

The description shall state at least the part or component number, part or component name, the size of the part or component, an explanatory description, the quantity used, the material of which the part or component is made, the coating (if any), date of purchase, as well as any relevant remarks as to the application thereof.

Details of the manufacturer of the part or component shall also be listed. This shall at least state the name, address, telephone number, fax number and name of a contact person.

The supplier of the part or component shall also be stated and shall include at least the name, address, telephone number, fax number, name of a contact person and an alternative supplier (if available).

SB 04.04.04 Drawings

Drawings shall contain a descriptive heading, an explanatory key and relevant comments. Drawings shall be done on a computer-aided design package approved by the Engineer.

A compound drawing for all subassemblies shall clearly indicate how and where the various parts fit in the subassembly. The compound drawing shall be linked to the equipment data sheets and parts and components list and shall clearly specify the parts or components used, their model numbers, their sizes and the quantities used. The compound drawings shall also be accompanied by a short description explaining the workings of the subassembly, as well as the assembly of the parts or components to complete the subassembly.

SB 04.05 OPERATING PROCEDURES

The operating instructions shall be a step by step description of the manual start-up and shut-down procedure for every piece of equipment and/or process reconditioned, repaired or supplied with references to the MFDs. For automatic operation the operators shall be referred to the automatic control manual (if applicable).

The functioning of the installation shall be clearly described, using a flow diagram depicting the interrelationships among the various subassemblies. The subassemblies shall be described by descriptive drawings.

Each mechanical or process flow diagram shall contain at least a heading, relevant comments and a key.

Every subassembly shall also have its own flow diagram explaining the operation of the subassembly, as well as the application of each part and component. The application of the subassembly shall also be very clear. The flow diagram shall consist of at least a heading, relevant comments and an explanatory key.

A detailed description shall be given of all operational systems forming part of the installation, explaining the operation and functioning of the system and the number of operations personnel required for performing the operation successfully.

The preparations, which are required before the system can be operational, shall be clearly stated and explained.

The operation tasks shall be clearly explained with reference to dangerous situations that might occur. Hazardous operations shall be explained in great detail and cover all the applicable safety precautions.

SB 04.06 MAINTENANCE

SB 04.06.01 Purpose of maintenance

The maintenance process shall be explained and the main responsibilities described.

SB 04.06.02 Preventative maintenance

A preventative maintenance and lubrication schedule shall be included in this section. This schedule shall be in table format and shall include a summary of all the maintenance actions required for each different system and/or functional unit covered by this manual, in order to give a single summary of all routine preventative maintenance actions required for the complete installation.

The schedule shall indicate daily, weekly, fortnightly, monthly and yearly maintenance actions. A lubrication schedule summary shall also be included under this section.

The frequency of routine preventative maintenance actions shall be indicated very clearly.

The Contractor shall provide the maintenance requirements as prescribed by the manufacturer. The type of maintenance shall be clearly indicated. The description of the maintenance to be performed shall include at least the part name, location of the part in either the assembly or subassembly, the model number, the quantity of the particular part or component to be maintained, the type of maintenance, and notes on the maintenance procedure.

A brief description shall accompany the maintenance schedule, indicating special tools to be used, maintenance and test equipment required for the test procedures. Any special tools necessary for maintenance shall be specified in terms of name, model, size, manufacturer, supplier (name, telephone number, fax number, contact person), coating (if any) and notes on the use of the equipment.

Remarks on the system readiness checks of each subassembly shall be explained in detail. Routine inspection and maintenance processes shall be described. It shall be

very clear what needs to be done, how to perform the necessary task and any dangers that are present.

SB 04.06.03 Trouble-shooting

An explanation shall be given to assist the maintenance personnel in analysing and resolving malfunctions that might occur. Various scenarios with possible causes and rectification procedures shall be explained.

The scenarios shall be accompanied by drawings indicating the position of the part that is faulty. Each of these drawings shall have a heading, comments and an explanatory key.

SB 04.07 BREAKDOWN MAINTENANCE AND REPAIR

The Contractor shall describe the complete procedure to be followed in the event of a breakdown. It shall be very clear what the operating personnel should look for, how to eliminate any dangers due to the breakdown (eg electricity must be shut off in the event of problems with the wiring) and who should be contacted. The Contractor shall supply the names and telephone numbers of at least two contact persons who may be contacted in the event of a breakdown.

The Contractor shall refer to Additional Specification SA: General Maintenance, to determine the reaction time for the repair to the breakdown.

Repair instructions shall provide the maintenance personnel with detailed instructions for the removal and/or replacement of any item requiring replacement due to malfunctioning. Contact numbers shall also be given to assist maintenance personnel, should a breakdown occur.

The Contractor shall specify the actions expected of maintenance personnel in the event of a breakdown.

The Contractor shall also specify the testing procedures to be followed before the system can be put into operation again. Every procedure shall be described clearly and all the potential dangers pointed out, as well as the precautions that have to be taken.

The testing procedures shall be accompanied by drawings illustrating the process to be performed. Every drawing shall have a heading, comments and an explanatory key.

SB 05 MEASUREMENT AND PAYMENT

SB.01 COMPILE AND SUPPLY A COMPLETE SET OF OPERATING AND MAINTENANCE MANUALS ..... Unit : site installation

The unit of measurement shall be an amount for each complete set **(seven copies)** of Operating and Maintenance Manuals provided for the applicable installation per site. Operating and Maintenance Manuals for different installations shall be measured separately in the Schedule of Quantities.

The tendered sum shall include full compensation for all technical research, gathering of information, compilation of manufacturer's instructions, compilation of drawings and diagrams, and for writing of all the descriptions, instructions and functional procedures, as well as language editing, in order to provide a clear and correct set of Operating and Maintenance Manuals.

The tendered sum shall also include full compensation for all expenses such as paper, copy work, binding and printing necessary for the completion of the manuals.

The tendered sum shall also include full compensation for the compilation of draft sets of operating and maintenance manuals in accordance with the specification, and for incorporation of all comments and corrective requirements.

ADDITIONAL SPECIFICATION

SD GENERAL TRAINING

CONTENTS

SD 01 SCOPE

The Contractor shall be responsible for providing diverse training to various groups, including operating and maintenance personnel. The Contractor shall develop and facilitate initial training sessions for all parties, as well as training sessions at specified intervals to revive and supplement the initial training. An accredited trainer shall present all training sessions.

This specification includes all requirements for methods to be employed, the syllabus required by the User Client, the syllabus required for maintenance managers and workers and the method of measurement and payment.

SD 02 BASIC METHOD REQUIREMENT

The Contractor shall be responsible for conducting a complete investigation of the groups that have to be trained in order to compile a proper training plan.

The investigation shall cover at least the following aspects:

(a) Assess likelihood of conformance to task-specific requirements *(status quo)* of capabilities.

(b) Identify minimum pre-qualification criteria in terms of existing knowledge and skill levels in relation to reaching target requirements.

(c) Evaluate personnel in terms of pre-qualification criteria and tasks to be performed (skills profile).

(d) Identify training needs.

(e) Develop appropriate and accredited training courses and material in terms of task-specific activities and identified training needs, and compile the training syllabus per installation.

The Contractor shall identify an accredited trainer to assist in the above investigation and finalise the compilation of a training plan and syllabus. Once the training plan and syllabus have been approved the Contractor shall liaise with the Engineer to establish a date and appropriate training venue that would be conductive to learning to perform training.

SD 03 TRAINING OF USER CLIENT PERSONNEL

The Contractor's training shall include training of the User Client's personnel to acquaint them with operating of installations. The training sessions shall comprise lectures and on-site (hands-on) demonstrations. The Contractor shall liaise with the Engineer to prepare for the correct number of trainees.

SD 04 TRAINING OF PERSONNEL

The Contractor shall train either his own employees, or local labourers, with regard to maintenance of the installation.

The training of maintenance managers shall include the following aspects:

(a) Awareness of safety, health and personal hygiene in terms of the requirements of the Occupational Health and Safety Act, 1993 (Act 85 of 1993);

(b) functioning of the installation, including all its systems, services, parts of buildings and infrastructure;

(c) all specific tasks related to routine preventative maintenance;

(d) interpretation and understanding of Operating and Maintenance Manuals with specific reference to requirements in cases of corrective and breakdown maintenance.

ADDITIONAL SPECIFICATION

SF GENERAL OPERATION

CONTENTS

SF 01 SCOPE

Operation of the specified systems, services or equipment shall all be referred to as "Operation of an Installation". Operation of an installation shall ensure effective functioning and optimum operational condition thereof. Monthly operation responsibilities for the required installations including all units and components as specified shall commence with access to the installation.

Operation of an installation shall be performed in accordance with Specifications and the Operating and Maintenance Manuals.

Remuneration for operation is provided for in the Bill of Quantities by means of monthly payment items, depending on the score achieved.

This Additional Specification covers operation requirements, site operation administration, communication operation performance measurement, as well as the items for measurement of the Contractor's service level and resulting payment.

SF 02 OPERATION REQUIREMENTS

SF 02.01 CONTRACTOR'S RESPONSIBILITIES

The Contractor shall operate the complete installation for the 36-month Contract period.

Operation implies and shall include hourly operation, daily operation (night and day), weekly as well as monthly operation on all components of the specified installations, *including* public holidays and non working days.

The Contractor shall operate the equipment as detailed in the specifications and the operation and maintenance manuals. Each operational function, task, test or action shall be recorded in an approved format and listed in a monthly report by the Contractor.

The Contractor shall ensure through training that the operating and maintenance personnel are conversant with the instructions as presented in the Operating and Maintenance Manuals. Continued training shall be included for the duration of the 36-month Contract.

The Contractor shall perform all Operational tasks as described in the Operating and Maintenance Manuals.

SF 02.02 **COMPONENTS INCLUDED IN OPERATION SCOPE**

The main sections of a facility with their subsections are as set out in the Specifications where applicable and in the Bill of Quantities and will each be deemed "an installation". Operation, as specified, will be applicable to all of the installations listed in the schedule of quantities under the "OPERATION OF INSTALLATION" section

SF 02.03 **SITE OPERATION RECORD KEEPING**

The Contractor shall provide and maintain hard-cover A4 Operation files for each installation that needs to be operated for the duration of the Contract. All schedules, checklists, actions, tasks, reports, hourly, daily and monthly operational records and monthly reports shall be incorporated into the monthly maintenance control plan.

SF 02.04 **SUPPLY OF LABOUR, EQUIPMENT AND MATERIAL**

SF 02.04.01 **Labour (qualified where necessary)**

Competent personnel (qualified where necessary) that have been trained by the Contractor or external training authority shall execute all Operational work.

SF 02.04.02 **Equipment**

All tools and equipment required for Operation work shall be supplied by the Contractor at his cost (except where otherwise provided).

SF 02.04.03 **Material**

All material, equipment, testing equipment, protective clothing and appurtenances necessary for the complete operation of each installation shall be supplied and installed by the Contractor at his cost. Remuneration for *maintenance* actions and material shall be measured elsewhere in this document.

The technical specification of each specific installation to be operated, shall indicate whether the contractor should supply other consumables (such as chemicals) as part of his operation requirements.

SF 03 **OPERATION CONTROL**

Operation quality control shall be the responsibility of the Contractor. The Contractor shall introduce his own quality assurance system to assist him in ensuring that hourly, daily and monthly operational tasks are performed as described in the operating and maintenance manuals and Specifications.

SF 04 **COMMUNCATION**

The contractor shall include the following operational results in the maintenance control plan on a monthly basis:

- The quality of waste water discharged into the environment and the total recorded weekly (compiled monthly).
- Record keeping of activities as specified shall be up to date on a daily basis and available to the Engineer on inspection.
- The quality of domestic waste water discharged into the environment.
- Details of failures and malfunctions and details of measures taken to avoid environmental pollution.

SF 05 PERFORMANCE MEASUREMENT

The Contractor's performance shall be measured against the following parameters:

SF 05.03 PERFORMANCE-BASED PAYMENT

SF 05.03.01 Score-card

The Engineer shall inspect each installation monthly. The Engineer shall use a score-card to measure the quality of operational tasks rendered by the Contractor during the preceding month, on all components that form part of the installation, in accordance with the Operation specifications. The Engineer will record his inspection directly onto the score-card. The score-card shall serve to evaluate ten performance indicators each month in the manner set out below.

The Contractor shall always have the opportunity to score the maximum points, provided that his operation work complies with the Specifications. The Employer shall be protected against a reduced or unsatisfactory operational level.

SF 05.03.02 Performance indicators

Performance indicators shall be selected to measure the Contractor's service level of operation.

The Contractor and the Engineer shall each have the opportunity to select five (5) performance indicators each month, which shall focus on the measurement of operation quality against the relevant specifications for the ensuing month. All ten (10) performance indicators are known to both the Engineer and the Contractor.

The Contractor shall aim to perform satisfactorily on all ten performance indicators. All indicators shall be selected from the scope of his normal hourly, daily and monthly operation work and shall be based on the operation control plan and operating and maintenance manuals. The work shall either be satisfactory, or unsatisfactory, and the Contractor shall score one (1) or zero (0) respectively per indicator. Performance indicators shall be used to focus on certain key aspects of the work and shall in no way limit the Contractor's responsibility to do all the required work.

SF 05.03.03 Satisfactory performance

The Engineer shall inspect the site on an arbitrary day to measure the quality of operation against the ten selected performance indicators. Should the Contractor score the maximum points (10) he shall receive his full operation payment for the installation. Should the quality of operation be unsatisfactory according to the score-card, the Contractor may fail to achieve full payment due to a reduced service level. Each monthly payment for operation shall be subject to evaluation based on the score-card.

SF 06 MEASUREMENT AND PAYMENT

SF.01 **OPERATION OF AN INSTALLATION**.....Unit: month

The unit of measurement shall be a calendar month and shall include full compensation for all liabilities and obligations described or implied in the Contract document and deemed by the Contractor to be applicable to the operation of an entire installation, and all appurtenant works deemed to form part thereof, as defined in the relevant Specifications.

It shall also include full compensation for complete hourly, daily, weekly and monthly operation as well as all chemicals and testing equipment required to operate the installation in accordance with the Department of Water Affairs specifications.

ADDITIONAL SPECIFICATION

SH HIV/AIDS REQUIREMENTS

CONTENTS

SH 01 SCOPE

This specification contains all requirements applicable to the Contractor for creating HIV/AIDS awareness amongst all of the Workers involved in this project for the duration of the construction period, through the following strategies:

- Raising awareness about HIV/AIDS through education and information on the nature of the disease, how it is transmitted, safe sexual behaviour, attitudes towards people affected and people living with HIV/AIDS, how to live a healthy lifestyle with HIV/AIDS, the importance of voluntary testing and counselling, the diagnosis and treatment of Sexually Transmitted Infections and the closest health Service Providers
- Informing Workers of their rights with regard to HIV/AIDS in the workplace
- Providing Workers with access to condoms and other awareness material that will enable them to make informed decisions about sexual practices

SH 02 DEFINITIONS AND ABBREVIATIONS

SH 02.01 DEFINITIONS

Service Provider: The natural or juristic person recognised and approved by the Department of Public Works as a specialist in conducting HIV/AIDS awareness programmes.

Service Provider Workshop Plan: A plan outlining the content, process and schedule of the training and education workshops, presented by a Service Provider which has been approved by the Representative/Agent.

Worker: Person in the employ of the Contractor or under the direction or supervision of the Contractor or any of his Sub-contractors, who is on site for a minimum period of 30 days in total.

SH 02.02 ABBREVIATIONS

HIV	:	Human Immunodeficiency Virus
AIDS	:	Acquired Immune Deficiency Syndrome
STI	:	Sexually Transmitted Infection

SH 03 BASIC METHOD REQUIREMENT

The Contractor shall, through a Service Provider, conduct onsite workshops with the Workers

The Service Provider shall develop and compile a Service Provider Workshop Plan to be presented at the workshops and which will be best suited for this project to achieve the specified objectives with regard to HIV/AIDS awareness.

The Service Provider Workshop Plan shall be based on the following information provided by the Contractor:

- Number of Workers and Sub-contractors on site
- When new Workers or Sub-contractors will join the construction project
- Duration of Workers and Sub-contractors on site
- How the maximum number of Workers can be targeted with workshops
- How the Contractor prefers workshops to be scheduled, *e.g.* three hourly sessions per Worker, or one 2.5 hour workshop per Worker
- Profile of Workers, including educational level, age and gender (if available)
- Preferred time of day or month to conduct workshops
- A Gantt chart reflecting the construction programme, for scheduling of workshops
- Suitable venues for workshops

The Contractor shall submit the Service Provider Workshop Plan for approval within 21 days after the tender acceptance date. After approval by the Representative/Agent, the Contractor shall make available a suitable venue that will be conducive to education and training.

The Service Provider Workshop Plan shall address, but will not be limited to the following:

- The nature of the disease;
- How it is transmitted;
- Safe sexual behaviour;
- Post exposure services such as voluntary counselling and testing (VCT) and nutritional plans for people living with HIV/AIDS;
- Attitudes towards other people with HIV/AIDS;
- Rights of the Worker in the workplace;
- How the Awareness Champion will be equipped prior to commencement of the HIV/AIDS awareness programme with basic HIV/AIDS information and the necessary skills to handle questions regarding the HIV/AIDS awareness programme on site sensitively and confidentially;
- How the Service Provider will support the Awareness Champion;
- Location and contact numbers of the closest clinics, VCT facilities, counselling services and referral systems;
- How the workshops will be presented, including frequency and duration;
- How the workshops will fit in with the construction programme;
- How the Service Provider will assess the knowledge and attitude levels of attendees to structure workshops accordingly;
- How the video will be used;
- How the Service Provider will elicit maximum participation from the Workers;
- A questions and answers slot (interactive session)
- The Service Provider Workshop Plan shall encompass the Specific Learning Outcomes (SLO) as stipulated

SH 04 HIV/ AIDS AWARENESS EDUCATION AND TRAINING

SH 04.01 WORKSHOPS

The Contractor shall ensure that all Workers attend the workshops.

The workshops shall adequately deal with all the aspects contained in the Service Provider Workshop Plan. A video of HIV/AIDS in the construction industry, which can be obtained from all Regional Offices of the Department of Public Works, is to be screened to Workers at workshops. In order to enhance the learning experience, groups of not exceeding 25 people shall attend the interactive sessions of the workshops.

SH 04.02 RECOMMENDED PRACTICE

SH 04.02.01 WORKSHOP SCHEDULE

Presenting information contained in the Service Provider Workshop Plan can be divided in as many workshop sessions as deemed practicable by the Contractor, provided that all Workers are exposed to all aspects of the workshops as outlined in the Service Provider Workshop Plan.

Breaking down the content of information to be presented to Workers into more than one workshop session however, has the added advantage that messages are reinforced over time while providing opportunity between workshop sessions for Workers to reflect and test information. Workers will also have an opportunity to ask questions at a following session.

SH 04.02.02 SERVICE PROVIDERS

A database of recommended Service Providers is available from all Regional Offices of the Department of Public Works

SH 04.02.03 HIV/AIDS SPECIFIC LEARNING OUTCOMES AND ASSESSMENT CRITERIA

Workers shall be exposed to workshops for a minimum duration of two-and-a-half hours. In order to set a minimum standard requirement, the following specific learning outcomes and assessment criteria shall be met.

04.02.03.01 UNIT 1: The nature of HIV/AIDS

After studying and understanding this unit, the Worker will be able to differentiate between HIV and AIDS and comprehend whether or not it is curable. The Worker will also be able to explain how the HI virus operates once a person is infected and identify the symptoms associated with the progression of HIV/AIDS.

Assessment Criteria:

1. Define and describe HIV and AIDS
2. List and describe the progression of HIV/AIDS

04.02.03.02 UNIT 2: Transmission of the HI virus

After studying and understanding this unit, the Worker will be able to identify bodily fluids that carry the HI virus. The Worker will be able to recognise how HIV/AIDS is transmitted and how it is not transmitted.

Assessment Criteria:

1. Record in what bodily fluids the HI virus can be found
2. Describe how HIV/AIDS can be transmitted
3. Demonstrate the ability to distinguish between how HIV/AIDS is transmitted and misconceptions around transmittance of HIV/AIDS

04.02.03.03 UNIT 3: HIV/AIDS preventative measures

After studying and understanding this unit, the Worker will comprehend how to act in a way that would minimise the risk of HIV/AIDS infection and to use measures to prevent the HI virus from entering the bloodstream.

Assessment Criteria:

1. Report on how to minimise the risk of HIV/AIDS infection
2. Report on precautions that can be taken to prevent HIV/AIDS infection
3. Explain or demonstrate how to use a male and female condom
4. List the factors that could jeopardize the safety of condoms provided against HIV/AIDS transmission

04.02.03.04 UNIT 4: Voluntary HIV/AIDS counselling and testing

After studying and understanding this unit, the Worker will be able to recognise methods of testing for HIV/AIDS infection. The Worker will be able to understand the purpose of voluntary HIV/AIDS testing and pre- and post-test counselling

Assessment Criteria:

1. Describe methods of testing for HIV/AIDS infection
2. Report on why voluntary testing is important
3. Report on why pre- and post-test counselling is important

04.02.03.05 UNIT 5: Living with HIV/AIDS

After studying and understanding this unit, the Worker will be able to recognise the importance of caring for people living with HIV/AIDS and be able to manage HIV/AIDS.

Assessment Criteria

1. List and describe ways to manage HIV/AIDS
2. Describe nutritional needs of people living with HIV/AIDS
3. Describe ways to embrace a healthy lifestyle as a person living with HIV/AIDS
4. Explain the need for counselling and support to people living with HIV/AIDS

04.02.03.06 UNIT 6: Treatment options for people with HIV/AIDS

After studying and understanding this unit, the Worker will be familiar with the various treatments available to HIV/AIDS infected or potentially HIV/AIDS infected people

Assessment Criteria

1. Discuss anti-retroviral therapy
2. List methods of treatment to prevent HIV/AIDS transmission from mother-to-child
3. Describe the need for treatment of opportunistic diseases for people living with HIV/AIDS
4. Describe post exposure prophylactics

04.02.03.07 UNIT 7: The rights and responsibilities of Workers in the workplace with regard to HIV/AIDS

After studying and understanding this unit, the Worker will be able to identify the rights and responsibilities of the Worker living with HIV/AIDS in the workplace. The Worker will recognise the importance of accepting colleagues living with HIV/AIDS and treating them in a non-discriminative way

Assessment Criteria:

1. Discuss the rights of a person living with HIV/AIDS in the workplace
2. Discuss the responsibilities of a person living with HIV/AIDS in the workplace
3. Report on why acceptance and non-discrimination of colleagues living with HIV/AIDS is important

SH 04.03 DISPLAYING OF PLASTIC LAMINATED POSTERS AND DISTRIBUTION OF INFORMATION BOOKLETS

The Contractor shall obtain a set of four laminated posters conveying different key messages and information booklets, which are available from all Regional Offices of the Department of Public Works.

The above-mentioned posters and information booklets have been prepared to raise awareness and to share information about HIV/AIDS and STI's

Posters or display stands shall be displayed on site as soon as possible, but not later than 14 days after the date of site handover

Posters shall be displayed in areas highly trafficked by Workers, including toilets, rest areas, the site office and compounds

The posters on display must always be intact, clear and readable

Information booklets must be distributed to all Workers as soon as possible, but not later than 14 days after site handover, or as soon as the Worker joins the site

SH 05 PROVIDING WORKERS WITH ACCESS TO CONDOMS

The Contractor shall provide and maintain condom dispensers and make both male and female condoms, complying with the requirements of SANS 4074, available at all times to all Workers at readily accessible points on site, for the duration of the contract. The Contractor may obtain condom dispensers from the Department of Health and condoms may be obtained from the Local Clinic or the Department of Health.

At least one male and one female condom dispenser and a sufficient supply of condoms, all to the approval of the Representative/Agent, shall be made available on site within 14 days of site hand over. Contractors should note that arrangements to obtain condoms from the Department of Health Clinics prior to site hand over may be necessary, to ensure that condoms are available within 14 days of site handover.

Condoms shall be made available in areas highly trafficked by Workers, including toilets, the site office and compounds.

SH 06 ENSURING ACCESS TO HIV/AIDS TESTING AND COUNSELLING FACILITIES AND TREATMENT OF SEXUALLY TRANSMITTED INFECTIONS (STI)

The Contractor shall provide Workers with the names of the closest Service Providers that provide HIV/AIDS testing and counselling and Clinics providing Sexually Transmitted Infection (STI) diagnosis and treatment. Information on these Service Providers and Clinics must be displayed on a poster of a size not smaller than A1 in an area highly trafficked by Workers

SH 07 APPOINTMENT OF AN HIV/AIDS AWARENESS CHAMPION

Within 14 days of site handover the Contractor shall appoint an Awareness Champion from amongst the Workers, who speaks, reads and writes English, who speaks and understands all the local languages spoken by the Workers and who shall be on site during all stages of the construction period. The Contractor shall ensure that the Awareness Champion has been trained by the Service Provider on basic HIV/AIDS information, the support services available and the necessary skills to handle questions regarding the HIV/AIDS programme in a sensitive and confidential manner

The Awareness Champion shall be responsible for:

7.1 Liaising with the Service Provider on organising awareness workshops;

7.2 Filling condom dispensers and monitoring condom distribution;

7.3 Handing out information booklets;

7.4 Placing and maintaining posters

SH 08 MONITORING

The Contractor shall grant to the Representative/Agent reasonable access to the construction site, in order to establish that the Contractor complies with his obligations regarding HIV/AIDS awareness under this contract

The Contractor must report problems experienced in implementing the HIV/AIDS requirements to the Representative/Agent

The attached SITE CHECKLIST (SCHEDULE A) shall be completed and submitted at every construction progress inspection to the Representative/Agent

The attached SERVICE PROVIDER REPORT (SCHEDULE B) shall be completed and submitted on a monthly basis to the Department's Project Manager, through the Representative/Agent

The attached CONTRACTOR HIV/AIDS PROGRAMME REPORT (SCHEDULE C), a close out programme report, shall be completed by the Contractor at the end of the contract

SCHEDULE A

HIV/AIDS PROGRAMME: SITE CHECKLIST

When did construction commence _____

Name of Departmental Project Manager _____

Please refer to HIV/AIDS Programme activities during the reporting period

Tick the block if Contractor satisfactorily complied with specifications																												
DATE	**PI**				**PI**				**PI**				**PI**				**PI**				**PI**				**PI**			
	D	D	M	M	D	D	M	M	D	D	M	M	D	D	M	M	D	D	M	M	D	D	M	M	D	D	M	M
Programme implemented within 14 days of site handover																												
Awareness champion on site																												
HIV/AIDS awareness service provider report																												
Male condom dispenser																												
Sufficient male condoms available																												
Male condom dispenser in a highly trafficked area																												
Female condom dispenser																												
Sufficient female condoms available																												
Female condom dispenser in a highly trafficked area																												
All four types of posters displayed																												
Posters in a good condition																												
Posters in a highly trafficked area																												
Posters displayed on local support services: clinic & VCT centre																												
Support service poster/s in highly trafficked area																												
Support service poster/s in a good condition																												

Please indicate the applicable number for the reporting period							
Workers on payroll (at PI)							
Sub-Contractors who will be on site for longer than 30 days (at PI)							
Workshop attendees							
Number of workshops held							
Scheduled workshops according to approved workshop plan							
Booklets distributed							
Male condoms distributed							
Female condoms distributed							
_____ Representative/Agent							
_____ Contractor							

Date of progress inspection (dd/mm/yy) _____

Reporting period: (dd/mm/yy)_____ to (dd/mm/yy) _____

Deviations from HIV/AIDS awareness programme plan:

Corrective actions

_____ _____

Representative/Agent Departmental Project Manager

_____ _____

Date Date

SCHEDULE B

HIV/AIDS AWARENESS PROGRAMME: SERVICE PROVIDER REPORT

Reporting period: (dd/mm/yy)_____ to (dd/mm/yy) _____

Number of workshops conducted in reporting period _____

Number of scheduled workshops according to approved workshop plan _____

Deviations from workshop plan:

State reasons for deviating from workshop plan:

Corrective actions:

_____ _____

Service Provider Contractor

_____ _____

Date Date

HIV/AIDS AWARENESS PROGRAMME: WORKSHOP CONTENT ADDRESSED

Fill in the applicable information with regard to each workshop conducted																												
DATE	**W/S**				**W/S**				**W/S**				**W/S**				**W/S**				**W/S**				**W/S**			
	D	D	M	M	D	D	M	M	D	D	M	M	D	D	M	M	D	D	M	M	D	D	M	M	D	D	M	M
Content of workshop: *(Mark the content included)*																												
SLO1																												
SLO2																												
SLO3																												
SLO4																												
SLO5																												
SLO6																												
SLO7																												
HIV/AIDS in construction video																												
Indicate the duration of the workshop in hours																												
Total number of Workers																												
Indicate workshop venue																												

HIV/AIDS AWARENESS PROGRAMME: ATTENDANCE REGISTER

Fill in your name and indicate attendance by ticking the appropriate date

DATE		W/S				W/S				W/S				W/S				W/S				W/S				W/S			
		D	D	M	M	D	D	M	M	D	D	M	M	D	D	M	M	D	D	M	M	D	D	M	M	D	D	M	M
No	NAMES																												

SCHEDULE B

SCHEDULE C

CONTRACTOR HIV/AIDS PROGRAMME REPORT

Project name _____

Project Location _____

Contract value of project (R) _____

Department of Public Works Project Manager _____

HIV/AIDS Programme duration: (dd/mm/yy) _____ to (dd/mm/yy) _____

AWARENESS MATERIAL

Describe location of posters displayed during the programme _____

_____

Comments on posters _____

_____

_____

Indicate total number of booklets distributed _____

Comments on booklets _____

_____

_____

CONDOMS

Indicate total number of male condoms distributed _____

Indicate total number of female condoms distributed _____

Describe where male condom dispenser was placed _____

Describe where female condom dispenser was placed _____

HIV/AIDS WORKSHOPS

Indicate the total number of HIV/AIDS workshops conducted _____

Indicate the duration of workshops _____

Indicate the total number of Workers that participated in the HIV/AIDS workshops _____

Indicate the total number of Workers that were exposed to the video on HIV/AIDS in the Construction Industry

_____

Comments on HIV/AIDS workshops on site _____

_____

GENERAL

Briefly describe programme activities and satisfaction with outcome _____

_____

_____

Additional comments, suggestions or needs with regard to the HIV/AIDS awareness programmes on site

_____

_____

_____

Please indicate if your company has a formal HIV/AIDS policy focussing on HIV/AIDS awareness raising and care and support of HIV/AIDS Workers	Yes	No	Currently developing one

Please indicate if, to your knowledge, you have lost any workers during the duration of the project to HIV/AIDS related sicknesses. One or more of the following might indicate an HIV/AIDS related death:

Excessive weight loss	Coughing or chest pain	Vomiting
Reactive TB	Pain when swallowing	Meningitis
Hair loss	Persistent fever	Memory loss
Severe tiredness	Diarrhoea	Pneumonia

Number of HIV/AIDS-related deaths _____

_____ _____

Contractor **Date**

_____ _____

Departmental Project Manager **Date**

ADDITIONAL SPECIFICATION

SI OCCUPATIONAL HEALTH AND SAFETY

CONTENTS

SI 01 APPLICABLE LEGISLATION AND REGULATIONS

This document was prepared to guide the Agent in the compilation of a Health and Safety Specification in terms of Sub-regulation 4(1)a of the Construction Regulation as published under Government Notice R.2003 of 18 July 2003. The content of this document or the fact it was made available for the use of the Agent will not relieve the Agent of any of his obligations in terms of the act.

The Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) together with its applicable Regulations ("the Act") forms part of this Health and Safety Specification. Any word or expression to which a meaning has been assigned in the Act shall have the meaning so assigned to it unless the context otherwise indicates.

SI 02 SCOPE OF WORK

All work forming part of this Contract is divided into installations. The maintenance and servicing work to be performed as part of the installations under this Contract mainly consists of the following: Buildings (Structural, Wet Services and Electrical), Roads, Stormwater, Water distribution, Sewer Networks, Standby Power generation, External Lighting and Fire fighting equipment at the various Ports of Entry as listed in the Scope of Works (PG-01.1)

SI 03 THE PRINCIPAL CONTRACTOR'S GENERAL DUTIES

The Principal Contractor's general duties in terms of this Health and Safety Specification are, but not limited to, the following:

1. Every Principal Contractor shall provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of his employees and other contractors.
2. Without derogating from the generality of a Principal Contractor's duties under subsection (1), the matters to which those duties refer include in particular -
   a. the provision and maintenance of systems of work, plant and machinery that, as far as is reasonably practicable, are safe and without risks to health;
   b. taking such steps as may be reasonably practicable to eliminate or mitigate any hazard or potential hazard to the safety or health of employees and other contractors, before resorting to personal protective equipment;
   c. making arrangements for ensuring, as far as is reasonably practicable, the safety and absence of risks to health in connection with the production, processing, use, handling, storage or transport of articles or substances;
   d. establishing, as far as is reasonably practicable, what hazards to the health or safety of persons are attached to any work which is performed, any article or substance which is produced, processed, used, handled, stored or transported and any plant or machinery which is used in his business, and he shall, as far as is reasonably practicable, further establish what precautionary measures should be taken with respect to such work, article, substance, plant or machinery in order to protect the health and safety of persons, and he shall provide the necessary means to apply such precautionary measures;
   e. providing such information, instructions, training and supervision as may be necessary to ensure, as far as is reasonably practicable, the health and safety at work of his employees and other contractors;
   f. not permitting any employee or contractor to do any work or to produce, process, use, handle, store or transport any article or substance or to operate any plant or machinery, unless the precautionary measures contemplated in paragraphs (b) and (d), or any other precautionary measures which may be prescribed, have been taken;
   g. taking all necessary measures to ensure that the requirements of this Health and Safety Specification are complied with by every person in his employment or on premises under his control where plant or machinery is used;
   h. enforcing such measures as may be necessary in the interest of health and safety;
   i. ensuring that work is performed and that plant or machinery is used under the general supervision of a person trained to understand the hazards associated with it and who have the authority to ensure that precautionary measures taken by the employer are implemented; and
   j. causing all employees and other contractors to be informed regarding the scope of their authority as contemplated in section 37(1)(b) of the Act.
   k. Monthly OHS audit and reporting.

SI 04 THE PRINCIPAL CONTRACTOR'S SPECIFIC DUTIES

The Principal Contractor's specific duties in terms of this Health and Safety Specification are specified in the Construction Regulation as published under Government Notice R. 2003 of 18 July 2003. (Hereinafter referred to as "Construction Regulation, 2003").

The Principal Contractor is specifically referred to the following sub-regulations of the Construction Regulation, 2003:

Subject	**Applicable sub-regulation of the Construction Regulation, 2003.**
Definitions	1
Scope of application	2
Notification of construction work	3
Principal Contractor and Contractor	5
Supervision of construction work	6
Risk assessment	7
Approved inspection authorities	29
Offences and penalties	30
Withdrawal of regulations	31
Short title	32

The Principal Contractor will acquaint himself with these duties and will make provision in his Contract price for the implementation and supervision of these duties.

SI 05 THE PRINCIPAL CONTRACTOR'S SPECIFIC DUTIES WITH REGARD TO HAZARDOUS WORK OR ACTIVITIES

The following hazardous work or activities were identified in terms of the Construction Regulation, 2003, and it is the duty of the Principal Contractor to ensure that the said work and activities are performed or carried out in terms of the relevant sub-regulations of the Construction Regulation, 2003 and other applicable Regulations.

Hazardous work or activity	**Applicable sub-regulation of the Construction Regulation, 2003.**	**Other applicable Regulations**
Fall protection	8	
Structures	9	
Formwork and support work	10	
Excavation	11	Precautionary measure as stipulated for confined spaces under the General Safety Regulations published under

Hazardous work or activity	**Applicable sub-regulation of the Construction Regulation, 2003.**	**Other applicable Regulations**
		Government Notice R.1031 of 30 May 1986, as amended.
Demolition work	12	Asbestos related work will be conducted in accordance with the Asbestos Regulations published under Government Notice R. 155 of 10 February 2002 as amended. Lead related work will be conducted in accordance with the Lead Regulations published under Government Notice R. 236 of 28 February 2002 as amended.
Scaffolding	14	Section 44 of the Act.
Suspended scaffolds	15	Section 44 of the Act.
Boatswains chairs	16	
Material hoists	17	
Explosive powered tools	19	
Cranes	20	Applicable provisions of the Driven Machinery Regulations as published under Government Notice R.533 of 16 March 1990, as amended.
Construction vehicles	21	
Electrical installations and machinery on construction sites.	22	Applicable provisions in the Electrical Installation Regulations published under

Hazardous work or activity	**Applicable sub-regulation of the Construction Regulation, 2003.**	**Other applicable Regulations**
		Government notice R.2920 of 23 October 1992 and the Electrical Machinery Regulations published under Government Notice R.1953 of 12 August 1988 respectively as amended.
Use and temporary storage of flammable liquids on construction sites.	23	Applicable provisions as stipulated in the General Safety Regulations published under Government Notice R.1031 of 30 May 1986, as amended.
Water environments	24	
Housekeeping on construction sites.	25	Applicable provisions as stipulated in the Environmental Regulations for Works places published under Government Notice R.2281 of 16 October 1987, as amended.
Stacking and storage on construction sites.	26	Applicable provisions as stipulated in the General Safety Regulations published under Government Notice R.1031 of 30 May 1986, as amended.
Fire precautions on construction sites.	27	Applicable provisions as stipulated in the Environmental Regulations for Works places published under Government Notice

Hazardous work or activity	Applicable sub-regulation of the Construction Regulation, 2003.	Other applicable Regulations
		R.2281 of 16 October 1987, as amended.
Construction Welfare facilities	28	Applicable provisions as stipulated in the Facilities Regulations under Government Notice R.1593 of 12 August 1988, as amended.

SI 06 MEASUREMENT AND PAYMENT

SI.01 **OCCUPATIONAL HEALTH AND SAFETY**.....Unit: month

The unit of measurement shall be a calendar month and shall include full compensation for all liabilities and obligations described or implied in the Contract document and deemed by the Contractor to be applicable for Compliance with OHS Act and Construction Regulations 2003, and all appurtenant works deemed to form part thereof, as defined in the relevant Specifications.

The contractor's Occupational Health and Safety shall be scored monthly as per the typical OHS-Audit Report contained in this specification. This item shall only be payable for the specific month in which the contractor ***exceeds*** an OHS-Audit-score of 95% or more. The contractor should note that all work on site may be stopped at any stage by the external OHS Auditor should the contractor not achieve the minimum score of 90% for the OHS Audit report.

SI 07 RESPONSIBILITIES OF CONTRACTOR & SUB CONTRACTORS

7.1 Principal Contractor and contractors appointed by the Principal Contractor

7.1.1 The Principal Contractor shall accept the appointment under the Terms and Conditions of Contract between the Department of Public Works and the Principal Contractor. The Contractor shall sign and agree to those terms and conditions and shall, before commencing work, notify the Department of Labour of the intended construction work in terms of Regulations 3 of the Construction Regulations. Annexure B of this Specification contains a "Notification of Construction Work" form. The Principal Contractor shall submit the notification in writing prior to commencement of work and inform Department of Public Works or his Agent accordingly. The above-mentioned notification of construction work must be kept available on site and be presented to any Inspector, Client Representative, Contractor or employee. **It is advised that the Labour Notification document be signed by both parties (Client and Principal Contractor) at site handover as no work, not even site establishment, will be allowed if this notification has not been sent to the department of Labour**

7.1.2 The Principal Contractor shall ensure that he/she is fully conversant with the requirements of this Specification and all relevant health and safety legislation. This Specification is not intended to supersede any Act, nor Regulations or any part of either. Those sections of the Act and the Construction Regulations, which apply to the scope of work to be performed by any Contractor in terms of this contract, (entirely or in part) will continue to be legally required of the Principal Contractor to comply with. No Contractor will in no manner or means be absolved from the responsibility to comply with all applicable sections of the Act, the Construction Regulations or any Regulations proclaimed under the Act, SABS Codes of Practise mentioned in any document pertaining to this project or which may perceivable be applicable to this contract.

7.1.3 The Principal Contractor shall provide and demonstrate to Department of Public Works a suitable and sufficiently documented health and safety plan based on this Specification, the Act and the Construction Regulations, which shall be applied from the date of commencement of and for the duration of execution of the works. This plan shall, as appendices, include the health and safety plans of all Sub-contractors for which he/she has to take responsibility in terms of this contract. **Note that no generic safety plan will be accepted. All safety plans shall be site specific.**

7.1.4 Any contractor involved in this project by means of construction work, supplying of any product, material or service, shall provide proof of his registration and good standing with the Compensation Commissioner or with a licensed compensation insurer prior to commencement with the works or service. Where the Department of Public Works have appointed any pre-selected or pre-approved contractor, such contractor will be seen as Principal Contractors and shall comply with all OHS requirements as set out in this document. **No contractor will be allowed on site without a letter of good standing from the Compensation Commissioner.**

7.1.5 The potential Principal Contractor shall, in submitting his/her tender, demonstrate that he/she has made provision for the cost of compliance with this Health and Safety Specifications and Requirement, the Act and any Regulations pertaining to the health and safety of employees at work. The Principal Contractor will furthermore ensure that any contractor appointed under him/her complies to this document ensuring that such a contractor:-

7.1.5.1 – is in good standing with the Compensation Commissioner

7.1.5.2 – Complies fully with the Basic Conditions of Employment Act of 1997.

7.1.5.3 - is fully conversant with the requirements set out in this document.

7.1.5.4 – have proof of qualification and certification of all appointed persons in terms of section 16.2 of the act, managers and supervisors in terms of the Act and any Regulations pertaining to the health and safety of employees at work. Should such certification not be valid or absent, such training shall be provided by the Client and costs incurred due to non-compliance shall be payable by the applicable contractor for the above-mentioned or any other training in terms of the Act or any Regulations pertaining to Health and Safety of employees.

7.1.5.5 – is a qualified contractor, specializing in the field for which he/she is appointed

7.1.5.6 – has the infrastructure and financial stability to adhere to all requirements within this document

7.1.5.7 – who is not represented on site by the Chief Executive Officer or Managing Director, a qualified person shall be appointed and available on site in terms of section 16.2 of the Act.

N.B. Construction Regulation 5(3) (g) determines that potential contractors submitting tenders have made provision for the cost of health and safety measures during the construction process. The Contractor shall on tendering make provision for the cost of health and safety measures in terms of his/her documented Health and Safety Plan and measures based on these Health and Safety Specifications during the period of the project. The cost shall be duly quantified and clearly identified for such identifiable purpose.

7.1.6 The Principal Contractor shall consistently demonstrate his competence and the adequacy of his resources to perform the duties imposed on his/her in terms of this Specification, the Act and the Construction Regulations.

7.1.7 The Principal Contractor shall ensure that a copy of all contractors on site's health and safety plans are available on site and will be presented upon request to Department of Public Works, Safety Officer, Inspector, Sub-contractor or employee.

7.1.8 The Principal Contractor shall ensure that all health and safety files, including those of sub-contractors appointed by the Principal Contractor are available on site as required in terms of these Specifications, the Act or any Regulations pertaining to the health and safety of employees on site, and made available to Department of Public Works or Inspector upon request. Upon completion of the works, the Principal Contractor shall hand over a consolidated health and safety filing system to the Department of Public Works.

7.1.9 The Contractor shall, throughout execution of the project, ensure that all conditions imposed on his Sub-contractors in terms of the Act and the Construction Regulations are complied with as if they are the Principal Contractor.

7.1.10 The Contractor shall from time to time evaluate the relevance of the Health and Safety Plan/system and revise the same as required, following which revised plan/system shall be submitted to Department of Public Works and/or his/her Agent for approval.

7.1.11 All contractors shall from time to time and before any work is started, ensure that a qualified appointed Risk Assessor conducts a risk assessment regarding such work and communicate these risks with the health and safety committee in order to manage such risks and retain safety to all employees at work. Should such an appointed person not have the knowledge and certification to execute his/her responsibilities, The Client will train and certify such person/s and costs for such training will be paid by the applicable contractor.

7.1.12 The Principal Contractors shall keep on site a daily Hazard Identification and Risk Assessment (HIRA) document, ensuring that all supervisors and employees are familiar with the daily risks pertaining to the work at hand. Such documentation shall be kept on file for reference purposes at the site office. All supervisors shall be fully qualified to perform a risk assessment to uphold his/her responsibility in terms of the Construction Regulations 6(6).

7.1.13 The Principal Contractor shall ensure that no employee or visitor is allowed on site without a written approval permit from the Principal Contractor. Such permit will only be issued after site safety induction training has been conducted and the emergency procedures communicated with such employee/visitor. All safety induction records and acknowledgments of understanding by employees/visitors shall be available on the safety file.

7.1.14 The Principal Contractor shall furthermore ensure that all contractors and employees entering the site are in possession of an identification card, containing a photo of the person carrying the identification, the employer detail and job description as well as any training detail.

7.2 Contractors appointed by the Principal Contractor

In addition, no contractor will be allowed to perform any work unless the following has been established and adhere to:

- Every contractor will enter into a mandatory agreement pertaining to the health and safety on site and to ensure the safety of his/her employees at work
- Every contractor will submit proof of good standing with the Compensation Commissioner. The contractor shall furthermore demonstrate an action plan of the renewal interval and process of the letter of good standing
- Before commencement of any work, the contractor will cause a risk assessment to be conduct by a certified Risk Assessor and take reasonable steps to ensure safety of his/her employees during such work.

- No contractor will be allowed on site without a written approval permit from the Principal Contractor. Site safety induction training must be conducted before any employee will be allowed to enter the site for the first time.

SI 08 HEALTH AND SAFETY FILE

Every contractor, which includes the Principal Contractor, shall in terms of Construction Regulation 5(7), keep a Health & Safety File on site at all times, which must include all documentation required in terms of the Act and Regulations. A full detailed index of the safety file required for this project is listed in section 24 of this document. The safety file of the Principal Contractor shall include a list of all Contractors on site who are appointed by the Principal Contractor and the agreements between the parties and details of work being done.

IMPORTANT

The Health and Safety File will remain the property of Department of Public Works and/or its Agent on its behalf throughout the period of the project and shall be consolidated and handed over to the Department of Public Works and/or its Agent on its behalf at the time of completion of the project. Under no circumstances may a safety file be removed form site or copied as all documentation in it is regarded as legal binding documents. Generic non site specific documentation will not be accepted.

SI 09 OHS GOALS AND OBJECTIVES AND ARRANGEMENTS FOR MONITORING AND REVIEWING OHS PERFORMANCE

The Principal Contractor is required to maintain an acceptable disabling incident frequency rate (DIFR) and report on this to Department of Public Works and/or its Agent on its behalf on a monthly basis.

The Principal Contractor shall ensure injury and incident records (Near Hits, First Aid, Medical cases, Disabling Lost Time Incidents), training etc. referred to above are kept on site. All documents shall be made available to the client for inspection including the Department of Labour's Inspectors as required by the Occupational Health and Safety Act, 85 of 1993.

The statistics formula as listed below shall be adhered to.

DIFR (Disabling Injury Frequency Rate) $\frac{\text{DI's x 1 000 000}}{\text{Man-hours}}$

SI 10 IDENTIFICATION OF HAZARDS AND DEVELOPMENT OF RISK ASSESSMENTS, SAFE WORKING PROCEDURES (SWP) AND METHOD STATEMENTS

- The Contractor is required to develop Baseline Risk Assessments, which must be included in the tender document, identifying all the risks involved taken in consideration, the scope of work as seen from the current site situation. This risk assessment will assist the contractor in proactively plan for safety management, safety budgeting and execution of his/her safety plan.
- Once taken site, the contractor will perform an Issue Based Risk Assessment, addressing individual processes within the construction process
- Safe Working Procedures (SWP) and Method Statements for each activity executed in the contract or project must be drafted and implemented.
- Each contractor shall implement a daily Hazard Identification and Risk Assessment (HIRA) system where hazards and risk assessments are discussed with all employees involved with a specific task.
- Once risks have been identified, notice boards, symbolic safety signs and instructions must be placed or installed to prevent incidents and warn all parties involved of such hazards and risks

SI 11 ARRANGEMENTS FOR MONITORING AND REVIEW

11.1 Monthly Audit by Client and/or its Agent on its behalf

Department of Public Works and/or its Agent on its behalf will be conducting Periodic Audits at times agreed with the Principal Contractor. Auditing will focus on the following:

- Legal compliance and documentation
- OHS Plan and implementation
- Appointment documentation
- Risk Assessments
- OHS Awareness
- Keeping of registers and checklists
- OHS Training
- OHS Committee
- Reporting, investigation and management of incidents
- Personal Protective Equipment
- Etc

11.2 Other audits and inspections by client and/or its agent on its behalf

Department of Public Works and/or its Agent on its behalf reserves the right to conduct any other ad hoc audits and inspections as it and/or its Agent on its behalf deem necessary.

A representative of the Principal Contractor and the relevant Health and Safety Representative(s) must accompany the Department of Public Works and/or its Agent on its behalf on all Audits and Inspections and may conduct their own audit/inspection at the same time. Each party will, however, take responsibility for the results of his/her own audit/inspection results. The Department of Public Works and/or its Agent on its behalf may require to be handed a copy of the minutes of the previous Health and Safety Committee meeting reflecting possible recommendations made by that committee to the Employee for reference purposes.

11.3 Reports

11.3.1 The Contractor shall report all incidents where an employee is injured on duty to the extent that he/she:

- dies
- becomes unconscious
- loses a limb or part of a limb
- is injured or becomes ill to such a degree that he/she is likely either to die or to suffer a permanent physical defect or likely to be unable for a period of at least 14 days either to work or continue with the activity for which he/she was usually employed.

OR where:

- a major incident occurred
- the health or safety of any person was endangered
- where a dangerous substance was pilled
- the uncontrolled release of any substance under pressure took place
- machinery or any part of machinery fractured or failed resulting in flying, falling or uncontrolled moving objects
- machinery ran out of control

to the Provincial Director of the Department of Labour within seven (7) days and at the same time to Department of Public Works and/or its Agent on its behalf.

Refer in this regard to Section 24 of the Act & General Administrative Regulation 8.

11.3.2 The Contractor is required to provide the Department of Public Works and/or its Agent on its behalf with copies of all statutory reports required in terms of the Act and the Regulations.

11.3.3 The Contractor is required to provide the Department of Public Works and/or its Agent on its behalf with a monthly "Health and Safety Risk Management Report".

11.3.4 The Contractor is required to provide a.s.a.p. Department of Public Works and/or its Agent on its behalf with copies of all internal and external accident/incident investigation reports including the reports contemplated below. As soon as the occurrence of any accident/incident of whatever nature comes to the notice of The Contractor, it shall be reported immediately to any of the following:

- Department of Public Works
- Client's Agent
- As per OHS Act

11.4 Review

The Principal Contractor is to review the Hazard Identification, Risk Assessments and Safe Work Processes monthly as the construction work develops and progresses and each time changes are made to the designs, plans and construction methods and processes.

The Principal Contractor must provide Department of Public Works and/or its Agent on its behalf, other Contractors and all other concerned parties with copies of any changes, alterations or amendments as contemplated in the above paragraph.

11.5 Site Rules and other Restrictions

11.5.1 Site Safety Rules

The Contractor must develop a set of ***site-specific*** OHS rules that will be applied to regulate the Health and Safety Plan and associated aspects of the construction. The site safety rules shall not be limited to, but include the following:

- No interaction shall take place between any employee and any visitor of the Port of Entry.
- No sleeping or any form of accommodation will be allowed on site
- No open fire will be allowed
- No alcohol or drug related substances will be allowed on site. The Principal Contractor shall either have breathalyser on site to prevent any person suspected of being intoxicated, from entering the site or appoint a sub-contractor to perform such a service.
- Smoking will not be allowed inside the Port of Entry buildings/structures.
- PPE issued shall include, but are not limited to:
    - SABS approved Safety boots. PVC Gumboots with steel toes and non-slip soles will be accepted
    - SABS approved overalls identifying the employer of such employee. No short pants will be allowed on site.
    - Employees working in areas where they are exposed to direct sunlight for long periods of time must be supplied with broad spectrum factor 30 sun block.
    - SABS approved hard hats
    - SABS approved hearing protection in noise demarcated areas
    - SABS approved safety harnesses with double lanyards
    - PPE issued shall not be off site
- No contractor, employee or visitor will be allowed on site without attending site safety induction training
- No employee or visitor will be allowed on site without the prescribed identification
- Emergency procedures shall be implemented
- First aid arrangements shall be implemented and communicated with all employees and visitors on site
- Reporting of incidents must be managed and a DIFR-rate be established

11.5.2 Security Arrangements

The Principal Contractor must establish site access rules and implement and maintain these throughout the construction period. Access control must include the rule that non-employees shall at all times be provided with fulltime supervision while on site.

All contractors and employees must be issued with proper identification as prescribed in section 7.2.14

After consultation with the user client, the principal Contractor must develop a set of Security rules and implement procedures and maintain these throughout the construction period.

After consultation with the BCOCC Port Coordinator, the Principal Contractor shall develop and implement an emergency plan to coincide with the BCOCC protocol regarding security arrangements in the case of emergencies.

No contractor, employee or visitor shall be allowed to interact with any Port of Entry visitors.

The Principal Contractor shall be responsible for his/her own security arrangements at store areas indicated by the BCOCC Port Coordinator.

11.6 Training

The contents and syllabi of all training required by the Act and Regulations pertaining to the Act, including any other or relevant training as required must be included in The Contractor's Health and Safety Plan and Health and Safety File.

11.6.1 General Induction Training

All employees and visitors must be in possession of proof of General Safety Induction training.

11.6.2 Other Training

All operators, drivers and users of construction vehicles, mobile plant equipment must be in possession of valid proof of training and certificate of competency. All operators of mobile machinery and construction vehicles as well as drivers shall be in possession of a medical certificate of fitness of which a copy shall be made available on the safety file.

All employees in jobs requiring training in terms of the Act and Regulations must be in possession of valid proof of training as follows:

Occupational Health and Safety Training Requirements: (as required by the Construction Regulations and as indicated by the Health and Safety Specification Document & the Risk Assessment/s and recommendations by the health and Safety Committee):

- General Induction (Section 8 of the Act)
- Site/Job Specific Induction (also visitors) (Sections 8 & 9 of the Act)
- Site/Project Manager
- Construction Supervisor (Construction Regulations 6.1)
- OHS Representatives (Section 18 (3) of the Act)
- Training of the Appointees indicated in 12.6.1 & 12.6.2 above
- Operation of Cranes (Driven Machinery Regulations 18 (11)
- Operators & Drivers of Construction Vehicles & Mobile Plant (Construction Regulation 21)
- Basic Fire Prevention & Protection (Environmental Regulations 9 and Construction Regulation 27)
- As a minimum basic First Aid to be upgraded when necessary (General Safety Regulations 3)
- Storekeeping Methods & Safe Stacking (Construction Regulation 26)
- Emergency, Security and Fire Co-coordinator
- All employees operating electrical power tools

11.7 Accident and Incident Investigation

The Principal Contractor is responsible to oversee the investigation process of all accidents/incidents where employees and non-employees were injured to the extent that he/she/they had to receive first aid or be referred for medical treatment by a doctor, hospital or clinic. (General Administrative Regulation 9)

The results of the investigation to be entered into the Accident/Incident Register listed above. (General Administrative Regulation 9)

The Contractor is responsible for the investigation of all non-injury incidents as described in Section 24 (1) (b) & (c) of the Act and keeping a record of the results of such investigations including the steps taken to prevent similar incidents in future.

The Contractor is responsible for the investigation of all road traffic accidents relating to the construction site and keeping a record of the results of such investigations including the steps taken to prevent similar accidents in future.

Notwithstanding the requirements of Section 24 of the Act, ALL incidents shall be investigated and reported on in writing, irrespective of whether such incident gave rise to injury or damage.

11.8 Health, Safety and Environmental Representatives (referred to as H&S Reps) and H&S Committees

11.8.1 Designation of H&S Representatives

Where a Contractor employs more than 20 persons (including the employees of other Contractors (sub-contractors) he/she has to appoint one H&S Representatives for every 50 employees or part thereof. (Section 17 of the Act and General Administrative Regulation 6 & 7).

H & S Representatives have to be designated in writing and the designation shall be in accordance with the collective Agreement as concluded between the parties as is required in terms of General Administration Regulation 6.

11.8.2 Duties and Functions of the H&S Representatives

The Contractor must ensure that the designated H&S Representatives conduct at least a weekly inspection of their respective areas of responsibility using a checklist and report thereon to the Principal Contractor, after which these reports shall be consolidated for submission to the Health and Safety Committee.

H&S Representatives must be included in and be part of accident/incident investigations.

H&S Representatives shall be members of at least one H&S Committee and must attend all meetings of that H&S committee.

11.8.3 Establishment of Health and Safety Committee(s)

The Contractor must establish a Health and Safety Committees consisting of designated H&S Representatives together with a number of Employers Representatives appointed as per Section 19(3) that are not allowed to exceed the number of H&S Representatives on the committee. The persons nominated by the employer on an H&S Committee must be designated in writing for such period as may be determined by him. The H&S Committee shall co-opt advisory (temporary) members and determine the procedures of the meetings including the chairmanship.

The H&S Committee must meet minimum monthly and consider at least the following Agenda for the first meeting. Thereafter the H&S Committee shall determine its own procedures as per the previous paragraph.

Agenda:

1) Opening and determining of chairmanship
2) Minutes of Previous Minutes and the process of compiling minutes
3) Observations
4) Program and Safety considerations
    - OHS Awareness campaign
    - Risk Assessments and HIRA
    - Contractors OHS cooperation
5) Hygiene
    - Drinkable water
    - Toilets for each sex
    - Toilet paper arrangements
    - Hand wash facilities, including soap and handtowels/paper
6) Housekeeping
7) Incidents & Accidents / Injuries
8) Registers:
    a H&S Rep. Inspections
    b. Matters of First Aid
    c. Scaffolding
    d. Ladders
    e. Excavations
    f. Portable Electric Equipment
    g. Fire Equipment
    h. Power Hand tools
    i. Incident Report Investigation
    j. Pressure Vessels
    k. Personal Protective Equipment
9) Safety performance Evaluations
10) Education & Safety promotion program
11) First Aid Officials and training in First Aid
12) Demarcation of work- /hazardous-/safe areas / walkways
13) Posters and signage
14) Environmental preservation and conservation
15) Waste Management
16) Specific training programmes
17) General
18) Date of Next Meeting
19) Closing

SI 12 PROJECT/SITE SPECIFIC REQUIREMENTS

The following is a list of specific activities and considerations that have been identified for the project and site and for which Risk Assessments, Safe Working Procedures (SWP), management and control measures and Method Statements (where necessary) have to be developed by The Contractor:

- Site Establishment including:
  - Office/s
  - Secure/Safe Storage and storage areas for materials, plant & equipment
  - Ablution facilities
  - Sheltered dining area
  - Access and Egress control
  - Vehicle access to the site
- Dealing with existing Structures
- Location of existing Services
- Installation & Maintenance of Temporary Construction Electrical Supply, Lighting and Equipment
- Adjacent Land uses/Surrounding property exposures
- Boundary & Access control/Public Liability Exposures (Remember: the Employer is also responsible for the OHS of non-employees affected by his/her work activities.)
- Health risks arising from neighbouring as well as own activities and from the environment e.g. threats by dogs, bees, snakes, lightning, allergies etc.
- Exposures to Noise
- Exposure to Vibration
- Exposure to dust
- Protection against dehydration and heat exhaustion
- Protection from wet & cold conditions
- Dealing with HIV/Aids and other diseases as per specific programme provided by Department of Public Works and/or its Agent on its behalf
- Use of Portable Electrical Equipment including:
  - Angle grinder
  - Electrical Drilling machine
  - Skill saw
- Excavations including
  - Ground/soil conditions
  - Trenching
  - Shoring
  - Drainage
  - Barricading
  - Flooding
  - Daily inspections
- Welding including:
  - Arc Welding
  - Gas welding
  - Flame Cutting
  - Use of LP Gas torches and appliances
- Loading & Offloading of Trucks
- Aggregate/Sand and other Materials Delivery
- Manual and Mechanical Handling
- Lifting and Lowering Operations
- Driving & Operation of Construction Vehicles and Mobile Plant including:
  - Trenching machine
  - Excavator
  - Bomag Roller
  - Plate Compactor
  - Front End Loader
  - TLB
  - Mobile Cranes and the ancillary lifting tackle
  - Parking of Vehicles & Mobile Plant
  - Towing of Vehicles & Mobile Plant

- Use and Storage of Flammable Liquids and other Hazardous Substances – Department of Public Works and/or its Agent on its behalf to be informed of this prior to commencing of the project
- Layering and Bedding of trench floor
- Installation of Pipes in trenches
- Backfilling of Trenches
- Protection against Flooding
- Gabion work
- Protection from Overhead Power Lines
- Any hazards discovered by any contractor
- As discovered from any inspections and audits conducted by Department of Public Works and/or its Agent on its behalf or by The Contractor or any other Contractor on site
- As discovered from any accident/incident investigation

12.1 The following are in particular requirements depending on scope of works and will form a basis for compliance audits.

1. Administrative & Legal Requirements
2. Education, Training & Promotion
3. Public Safety & Emergency Preparedness
4. Personal Protective Equipment
5. Housekeeping
6. Scaffolding, Formwork & Support work
7. Ladders
8. Electrical Safeguarding
9. Emergency/Fire Prevention & Protection
10. Excavations & Demolition
11. Tools
12. Cranes
13. Personnel & Material Hoists
14. Transport & Materials Handling
15. Site Plant & Machinery
16. Plant & Storage Yard/Site Workshops Specifics
17. Health & Hygiene

SI 13 OUTLINED DATA, REFERENCES AND INFORMATION ON CERTAIN AND/OR SPECIFIC OBLIGATORY REQUIREMENTS TO ENSURE COMPLIANCE

13.1 Administrative & Legal Requirements

OHS Act Section/ Regulations	Subject	Requirements
Construction. Regulation 3	**Notice of carrying out Construction work**	Department of Labour notified Copy of Notice available on Site
General Admin. Regulation 4	***Copy of OHS Act (Act 85 of 1993)**	Updated copy of Act & Regulations on site. Readily available for perusal by employees
COID Act Section 80	*Registration with Compensation. Insurer	Written proof of registration / Letter of good standing available on Site
Construction.	H&S Specification &	H&S Spec received from Client and/or its Agent

Regulation 4 & 5 (1)	Programme	on its behalf. OHS programme developed & Updated regularly
Section 8(2) (d) Construction. Regulation 7	*Hazard Identification & Risk Assessment	Hazard Identification carried out/Recorded Risk Assessment and – Plan drawn up/Updated RA Plan available on Site Employees/Sub-Contractors informed/trained
Section 16(2)	*Assigned duties (Managers)	Responsibility of complying with the OHS Act assigned to other person/s by CEO.
Construction. Regulation 6(1)	Designation of Person Responsible on Site	Competent person appointed in writing as Construction Supervisor with job description.
Construction. Regulation 6(2)	Designation of Assistant for above	Competent person appointed in writing as Assistant Construction Supervisor with job description
Section 17 & 18 General Administrative Regulations 6 & 7	*Designation of Health & Safety Representatives	More than 20 employees – one H&S Representative, one additional H&S Rep. for each 50 employees or part thereof. Designation in writing, period and area of responsibility specified in terms of GAR 6 & 7 Meaningful H&S Rep. reports. Reports actioned by Management.
Section 19 & 20 General Administrative Regulation 5	*Health & Safety Committee/s	H&S Committee/s established. All H&S Reps shall be members of H&S Committees Additional members are appointed in writing. Meetings held monthly, Minutes kept. Actioned by Management.
Section 37(1) & (2)	*Agreement with Man dataries / (Sub-) Contractors	Written agreement with (Sub-) Contractors List of (Sub-) Contractors displayed. Proof of Registration with Compensation Insurer/Letter of Good Standing Construction Supervisor designated Written arrangements re. H&S Reps & H&S Committee Written arrangements re. First Aid
Section 24 & General Admin. Regulation 8 COID Act Sect. 38, 39 & 41	*Reporting of Incidents (Dept. of Labour)	Incident Reporting Procedure displayed. All incidents in terms of Sect. 24 reported to the Provincial Director, Department of labour, within 3 days. (WCL 1 or 2) and to Department of Public Works and/or its Agent on its behalf. Cases of Occupational Disease Reported. Copies of Reports available on Site. Record of First Aid injuries kept.
General Admin. Regulation 9	*Investigation and Recording of Incident	All injuries which resulted in the person receiving medical treatment other than first aid, recorded and investigated by investigator designated in writing. Copies of Reports (Annexure 1) available on Site. Tabled at H&S Committee meeting Action taken by Site Management
Construction. Regulation 8	Fall Prevention & Protection	Competent person appointment to draw up and supervise the Fall Protection Plan. Proof of appointees' competence available on Site. Risk Assessment carried out for work at heights. Fall Protection Plan drawn up/updated. Available on Site.

Construction. Regulation 8(5)	Roof work	Competent person appointed to plan & supervise Roof work. Proof of appointees competence available on Site Risk Assessment carried out Roof work Plan drawn up/updated Roof work inspect before each shift. Inspection register kept Employees medically examined for physical & psychological fitness. Written proof on site
Construction. Regulation 9	Structures	Information re. the structure being erected received from the Designer including: - geo-science technical report where relevant - the design loading of the structure - the methods & sequence of construction - anticipated dangers/hazards/special measures to construct safely Risk Assessment carried out Method statement drawn up All above available on Site Structures inspected before each shift. Inspections register kept
Construction. Regulation 10	Formwork &Support work	Competent person appointed in writing to supervise erection, maintenance, use and dismantling of Support & Formwork Design drawings available on site Risk Assessment carried out Support & Formwork inspected: - before use/inspection - before pouring of concrete - weekly whilst in place - before stripping/dismantling - Inspection register kept
Construction. Regulation 14	Scaffolding	Competent persons appointed in writing to: - erect scaffolding (Scaffold Erector/s) - act as Scaffold Team Leaders - Inspect Scaffolding weekly and after inclement weather (Scaffold Inspector/s) - Written Proof of Competence of above appointees available on Site Copy of SABS 085 available on Site Risk Assessment carried out Inspected weekly/after bad weather. Inspection register/s kept
Construction. Regulation 15.	Suspended Platforms	Competent persons appointment in writing to: - control the erection of Suspended platforms - act as Suspended platforms Team Leaders - inspect Suspended Scaffolding weekly and after inclement weather Risk Assessment conducted Certificate of Authorisation issued by a registered professional engineer available on Site/copy forwarded to the Department of Labour The following inspections of the whole installation carried out by a competent person - after erection and before use

		- daily prior to use. Inspection register kept The following tests to be conducted by a competent person: - load test of whole installation and working parts every three months - hoisting ropes/hooks/load attaching devices quarterly. Test log book kept Employees working on Suspended Platform medically examined for physical & psychological fitness. Written proof available
Construction. Regulation 11	Excavation	Competent person/s appointment in writing to supervise and inspect excavation work Written Proof of Competence of above appointee/s available on Site Risk Assessment carried out Inspected: - before every shift - after any blasting - after an unexpected fall of ground - after any substantial damage to the shoring - after rain. Inspections register kept Method statement developed where explosives will be/are used
Construction. Regulation 12	Demolition Work	Competent person/s appointed in writing to supervise and control Demolition work Written Proof of Competence of above appointee/s available on Site Risk Assessment carried out Engineering survey and Method Statement available on Site Inspections to prevent premature collapse carried out by competent person before each shift. Inspection register kept
Construction. Regulation 22/Electrical Machinery Regulations 9 & 10/ Electrical Installation Regulations	*Inspection & Maintenance of Electrical Installation & Equipment (including portable electrical tools)	Competent person appointed in writing to inspect/test the installation and equipment. Written Proof of Competence of above appointee available on Site. Inspections: - Electrical Installation & equipment inspected after installation, after alterations and quarterly. Inspection Registers kept Portable electric tools, electric lights and extension leads must be uniquely identified/numbered. Weekly visual inspection by User/Issuer/Store man. Register kept.
Construction. Regulation 26/ General Safety Regulation 8(1)(a)	*Designation of Stacking & Storage Supervisor	Competent Person/s with specific knowledge and experience designated to supervise all Stacking & Storage Written Proof of Competence of above appointee available on Site
Construction. Regulation 27/ Environmental Regulation 9	*Designation of a Person to Co-ordinate Emergency Planning and Fire Protection	Person/s with specific knowledge and experience designated to co-ordinate emergency contingency planning and execution and fire prevention measures Emergency Evacuation Plan developed: - Drilled/Practiced - Plan & Records of Drills/Practices

		available on Site Fire Risk Assessment carried out All Fire Extinguishing Equipment identified and on **register**. Inspected weekly. Inspection Register kept Serviced annually
General Safety Regulation 3	*First Aid	Every workplace provided with sufficient number of First Aid boxes. (Required where 5 persons or more are employed) First Aid freely available Equipment as per the list in the OHS Act. One qualified First Aider appointed for every 50 employees. (Required where more than 10 persons are employed) List of First Aid Officials and Certificates Name of person/s in charge of First Aid box/es displayed. Location of First Aid box/es clearly indicated. Signs instructing employees to report all Injuries/illness including first aid injuries
General Safety Regulation 2	Personal Safety Equipment (PSE)	PSE Risk Assessment carried out Items of PSE prescribed/use enforced Records of Issue kept Undertaking by Employee to use/wear PSE PSE remain property of Employer, not to be removed from premises GRS 2(4)
General Safety Regulation 9	*Inspection & Use of Welding/Flame Cutting Equipment	Competent Person/s with specific knowledge and experience designated to Inspect Electric Arc, Gas Welding and Flame Cutting Equipment Written Proof of Competence of above appointee available on Site All new vessels checked for leaks, leaking vessels NOT taken into d stock but returned to supplier immediately Equipment identified/numbered and entered into a register Equipment inspected weekly. Inspection Register kept Separate, purpose made storage available for full and empty vessels.
Hazardous Chemical Substances (HSE)	*Control of Storage & Usage of HCS and Flammables	Competent Person/s with specific knowledge and experience designated to Control the Storage & Usage of HCS (including Flammables)
Regulations Construction Regulation 23		Written Proof of Competence of above appointee available on Site Risk Assessment carried out Register of HCS kept/used on Site Separate, purpose made storage available for full and empty containers
Vessels under Pressure Regulations	Vessels under Pressure (VUP)	Competent Person/s with specific knowledge and experience designated to supervise the use, storage, maintenance, statutory inspections & testing of VUP's Written proof of Competence of above appointee available on Site Risk Assessment carried out Certificates of Manufacture available on Site Register of VUP's on Site Inspections & testing by Approved Inspection Authority (AIA): - after installation/re-erection or repairs - every 36 months

		- Register/Log kept of inspections, test. Modification & repair
Construction. Regulation 21	Construction Vehicles & Earth Moving Equipment	Operators/Drivers appointed to: - Carry out a daily inspection prior to use - Drive the vehicle/plant that he/she is competent to operate/drive Written Proof of Competence of above appointee available on Site. Record of Daily inspections kept.
General Safety Regulation 13 A	*Inspection of Ladders	Competent person appointed in writing to inspect Ladders Ladders inspected at arrival on site and weekly thereafter. Inspections register kept Application of the types of ladders (wooden, aluminium etc.) regulated by training and inspections and noted in register
General Safety Regulation 13B	Ramps	Competent person appointed in writing to Supervise the erection & inspection of Ramps. Inspection register kept. Daily inspected and noted in register

13.2 Education & Training

Subject	Requirements
*Company OHS Policy Section 7(1) *Company/Site OHS Rules Section 13 (a) *Induction & Task Safety	Policy signed by CEO and published/Circulated to Employees Policy displayed on Employee Notice Boards Management and employees committed. Rules published Rules displayed on Employee Notice Boards Rules issued and employees effectively informed or trained: written proof Follow-up to ensure employees understand/adhere to the policy and rules. All new employees receive OHS Induction Training Training includes Task Safety Instructions.
Training (Section 13(a) *General OHS Training Section 13(a) *Occupational Health & Safety Promotion	Employees acknowledge receipt of training. Follow-up to ensure employees understand/adhere to instructions. All current employees receive specified OHS training: written proof Operators of Plant & Equipment receive specified training Follow-up to ensure employees understand/adhere to instructions. Incident Experience Board indicating e.g. *No. of hours worked without an Injury *No. of days worked without an Injury Mission, Vision and Goal Star Grading – Board kept up to date. Safety Posters displayed & changed regularly Employee Notice Board for OHS Notices. Site OHS Competition. Participation in Regional OHS Competition Suggestion scheme.

13.3 Public Safety, Security Measures & Emergency Preparedness

Subject	Requirement
*Notices & Signs	Notices & Signs at entrances / along perimeters indicating **"No Unauthorised Entry".** Notice & Signs at entrance instruction visitors and non – employees what to do, where to go and where to report on entering the site/yard with directional signs. E.g. where to go and where to report on entering the site/yard with directional signs. e.g. **"Visitors to report to Office"** Notices & Signs posted to warn of overhead work and other hazardous activities. e.g. **General Warning Signs**
Site Safeguarding *Security Measures	Nets, Canopies, Platforms, Fans etc. to protect members of the public passing / entering the site. Access control measures/register in operation Security patrols after hours during weekends and holidays Sufficient lighting after dark Guard has access to telephone/ mobile/ other means of emergency communication
*Emergency Preparedness	Emergency contact numbers displayed and made available to Security & Guard Emergency Evacuation instructions posted up on all notice boards (including employees' notice boards) Emergency contingency plan available on site/in yard Doors open outwards/unobstructed Emergency alarm audible all over (including in toilets)
***Emergency Drill & Evacuation**	Adequate No. of employees trained to use Fire Fighting Equipment. Emergency Evacuation Plan available displayed and practiced. **(See Section 1 for Designation & Register)**

13.4 Personal Protective Equipment

Subject	Requirement
*PPE needs analysis	Need for PPE identified and prescribed in writing. PPE remain property of Employer, not to be removed from premises GSR 2(4)
*Head Protection	All persons on site wearing Safety Helmets including Sub-contractors and Visitors (where prescribed)
*Foot Protection	All employees on site wearing Safety Footwear including Gumboots for concrete / wet work and non-slip shoes for roof work. Visitors to wear same upon request or where prescribed
*Eye and Face Protection	Eye and Face (also Hand and Body) Protection (Goggles, Face Shields, Welding Helmets etc.) used when operating the following: • Jackhammers • Angle / Bench Grinders • Electric Drills (Overhead work into concrete / cement / bricks • Explosive Powered tools • Concrete Vibrators / Pokers • Hammers & Chisels • Cutting / Welding Torches • Cutting Tools and Equipment • Guillotines and Benders • Shears • Sanders and Sanding Machines • CO2 and Arc Welding Equipment • Skill / Bench Saws • Spray Painting Equipment etc.

*Hearing Protection	Hearing Protectors (Muffs, Plugs etc.) used when operating the following: • Jackhammers • Explosive Powered Tools • Wood/Aluminium Working Machines e.g. saws, planers, routers
*Hand Protection	Protective Gloves worn by employees handling / using: • Cement / Bricks / Steel / Chemicals • Welding Equipment • Hammers & Chisels • Jackhammers etc.
*Respiratory Protection	Suitable/efficient prescribed Respirators worn correctly by employees handling / using: • Dry cement • Dusty areas • Hazardous chemicals • Angle Grinders • Spray Painting etc.
*Fall Protection Equipment	Suitable Safety Belts / Fall Arrest Equipment correctly used by persons working on / in unguarded, elevated positions e.g.: • Scaffolding • Riggers • Lift shafts • Edge work • Ring beam edges etc. • Other methods of fall prevention applied e.g. catch nets
*Protective Clotting	All jobs requiring protective clothing (Overalls, Rain Wear, Welding Aprons etc.) Identified and clothing worn.
*PPE Issue & Control	Identified Equipment issued free of charge. All PPE maintained in good condition. (Regular checks). Workers instructed in the proper use & maintenance of PPE Commitment obtained from wearer accepting conditions and to wear the PPE. Record of PPE issued kept on H&S File. PPE remain property of Employer, not to be removed from premises GSR 2(4)

13.5 Housekeeping

Subject	Requirement
*Scrap Removal System	All items of Scrap/Unusable Off-cuts/Rubble and redundant material removed from working areas on a regular basis. (Daily) Scrap/Waste removal from heights by chute/hoist/crane. Nothing thrown/swept over sides Scrap disposed of in designated containers/areas Removal from site/yard on a regular basis.
Stacking & Storage **(See Section 1 for Designation & Register)**	Stacking: • Stable, on firm level surface/base • Prevent leaning/collapsing • Irregular shapes bonded • Not exceeding 3x the base • Stacks accessible • Removal from top only Storage: • Adequate storage areas provided • Functional – e.g. demarcated storage areas/racks/bins etc. • Special areas identified and demarcated e.g. flammable gas, cement etc. • Neat, safe, stable and square. • Store/storage areas clear of superfluous material

	• Storage behind sheds etc. neat/under control • Storage areas free from weeds, litter etc.
*Waste Control/Reclaim action	Re-usable off-cuts and other re-usable material removed daily and kept to a minimum in the work areas. All re-usable materials neatly stacked/stored in designated areas. (Nails removed/bent over in re-usable timber). Issue of hardware/nails/screws/cartridges etc. controlled and return of unused items monitored.
Sub-contractors (Housekeeping)	Sub-contractors required complying with Housekeeping requirements.

13.6 Working at Heights (including roof work)

Subject	Requirement
Openings	Unprotected openings adequately guarded/fenced/barricaded/catch nets installed
General Hazards	Roof work discontinued when bad/hazardous weather Fall protection measures (including warning notices) when working close to edges or on fragile roofing material Covers over openings in roof of robust construction/secured against displacement

13.7 Scaffolding / Formwork / Support Work

Subject	Requirement
Access/System Scaffolding	Foundation firm / stable Sufficient bracing. Tied to Structure/prevented from side or cross movement Platform boards in good condition/sufficient/secured Handrails and toe boards provided Access ladders / stairs provided Area/s under scaffolding tidy Safe/unsafe for use signs Complying with OHS Act/SABS 085
Free Standing Scaffolding	Foundation firm / stable Sufficient bracing Platform boards in good condition/sufficient/secured Handrails and toe boards provided Access ladders / stairs provided Area/s under scaffolding tidy Safe/unsafe for use signs Height to base ratio correct Outriggers used / tied to structure where necessary Complying with OHS Act/SABS 085
*Mobile Scaffolding	Foundation firm / stable Sufficient bracing Platform boards in good condition/sufficient/secured Handrails and toe boards provided Access ladders / stairs provided Area/s under scaffolding tidy Safe/unsafe for use signs
*Mobile Scaffolding	Wheels / swivels in good condition Brakes working and applied Height to base ratio correct Outriggers used where necessary Complying with OHS Act/SABS 085
Suspended Scaffolding	Outriggers securely supported and anchored. Correct No. of steel wire ropes used.

	Platform as close as possible to the structure Handrails on all sides All winches / ropes / cables / brakes inspected regularly and replaced as prescribed Scaffolding complies with OHS Act (Act 85/93) Winch(es) maintained by competent person(s)
Formwork/ Support Work	All components in good condition. Foundation firm / stable. Adequate bracing / stability ensured. Good workmanship / uprights straight and plumb. Good cantilever construction Safe access provided. Areas under support work tidy. Same standards as for system scaffolding.
Special Scaffolding	Special Scaffolding e.g. Cantilever, Jib and Truss-out scaffolds erected to an acceptable standard and inspected by specialists.
Edges & Openings	Edges barricaded to acceptable standards. Manhole openings covered / barricaded. Openings in floor / other openings covered, barricaded/fenced. Stairs provided with handrails. Lift shafts barricaded / fenced off.

13.8 Ladders

Subject	Requirements
*Physical Condition / Use & Storage	Stepladders – hinges/stays/braces/stiles in order Extension ladders – ropes/rungs/stiles/safety latch/hook in order. Extension / Straight ladders secured or tied at the bottom / top. No joined ladders used Wooden ladders are never painted except with varnish Aluminium ladders NOT to be used with electrical work All ladders stored on hooks / racks and not on ground. Ladders protrude 900 mm above landings / platforms / roof. Fixed ladders higher than 5 m have cages / Fall arrest system

13.9 Electricity (as part of, or additional to the manual "Safety & Switching procedures for Electrical Installations" – see attached document)

Subject	Requirements
*Electrical Distribution Boards & Earth Leakage	Colour-coded / numbered / symbolic sign displayed. Area in front kept clear and unobstructed. Fitted with inside cover plate / openings blanked off / no exposed "live" conductors / terminals / Door kept close Switches / circuit breakers identified. Earth leakage protection unit fitted and operating. Tested with instrument: Test results within 15 – 30 milliamps Aperture / Opening/s provided for the plugging in and removal of extension leads without the need to open the door Apertures and openings used for extension leads to be protected against the elements and especially rain
*Electrical Installations & Wiring	Temporary wiring / extension leads in good condition / no bare or exposed wires. Earthling continuity / polarity correct: **Looking at the open connectors to connect the wiring, the word "Brown" has the letter 'R' in it, so the b'R'own wire connects to the 'R'ight hand connector. "Blue" has the letter 'L' in it, so the b'L'ue wire connects to the 'L'eft hand connector.** Cables protected from mechanical damage and moisture. Correct loading observed e.g. no heating appliance used from lighting circuit etc. Light fittings/lamps protected from mechanical damage/moisture.

	Cable arrestors in place and used inside plugs.
*Physical condition of Electrical Appliances & Tools	Electrical Equipment and Tools: (includes all items plugging in to a 16 Amp supply socket) Insulation / casing in good condition. Earth wire connected/intact where not of double insulated design Double insulation mark indicates that no earth wire is to be connected. Cord in good condition/no bare wires/secured to machine & plug. Plug in good condition, connected correctly and correct polarity.

13.10 Emergency and Fire Prevention Protection

Subject	Requirement
*Fire Extinguishing Equipment	Fire Risks Identified and on record The correct and adequate Fire Extinguishing Equipment available for: • Offices • General Stores • Flammable Store • Fuel Storage Tank/s and catchments well • Gas Welding / Cutting operations • Where flammable substances are being used / applied. • Equipment Easily Accessible
*Maintenance	Fire equipment checked minimum monthly, serviced yearly
*Location & Signs	Fire Extinguishing Equipment: • Clearly visible • Unobstructed • Signs posted including "No Smoking" / "No Naked Lights" where required (Flammable store, Gas store, Fuel tanks etc.)
*Storage Issue & Control of Flammables (incl. Gas cylinders)	Storage Area provided for flammables with suitable doors, ventilation, bund etc. Flammable store neat / tidy and no Class A combustibles. Decanting of flammable substances carried out in ignition free and adequately ventilated area. Container bonding principles applied Only sufficient quantities issued for one task or one day's usage Separate, special gas cylinder store/storage area. Gas Cylinders stored / used / transported upright and secured in trolley/cradle/structure and ventilated. Types of Gas Cylinders clearly identified as well as the storage area and stored separately. Full cylinders stored separately from empty cylinders. All valves, gauges, connections, threads of all vessels to be checked regularly for leaks. Leaking acetylene vessels to be returned to the supplier **IMMEDIATELY**.

13.11 Excavations

Subject	Requirement
Excavations deeper than 1.5 m.	Shored / Braced to prevent caving / falling in. Provided with an access ladder. Excavations guarded/barricaded/lighted after dark in public areas Soil dumped at least 1 m away from edge of excavation On sloping ground soil dumped on lower side of excavation All excavations are subject to daily inspections

13.12 Tools

Subject	Requirement
*Hand Tools	Shovels / Spades / Picks: • Handles free from cracks and splinters • Handles fit securely • Working end sharp and true Hammers: • Good quality handles, no pipe or reinforcing steel handles. • Handles free from cracks and splinters Handles fit securely Chisels: • No mushroomed heads / heads chamfered • Not hardened • Cutting edge sharp and square Saws: • Teeth sharp and set correctly • Correct saw used for the job
*Explosive Powered Tools	Only used by trained / authorized personnel. Prescribed warning signs placed / displayed where tool is in use. Work area must be properly isolated/demarcated during use of tool. Inspected at least monthly by competent person and results recorded. Issue and return recorded including cartridges / nails and unused cartridges / nails / empty shells recorded. Cleaned daily after use.

13.13 Transport & Materials Handling Equipment

Subject	Requirements
*Site Vehicles	All Site Vehicles, Dumpers, Bobcats, Loaders etc; checked daily before use by driver / operator. Inventory of vehicles used/operated on site Inspection by means of a checklist / results recorded. No persons riding on equipment not designed or designated for passengers. Site speed limit posted, enforced and not exceeded. Drivers / Operators trained / licensed and carrying proof. No unauthorized persons allowed to drive / operate equipment.
Conveyors	Conveyor belt nip points and drive gear guarded. Emergency stop/lever/brake fitted, clearly marked & accessible and tested to be functional under full load.

13.14 Site Plant and Machinery

Subject	Requirements
Brick Cutting Machine	Operator Trained Only authorized persons use the machine Emergency stop switch clearly marked and accessible. Area around the machine dry and slip/trip free/clear of off-cuts All moving drive parts guarded/electrical supply cable protected Operator using correct PPE – eye/face/hearing/foot/hands/body.
*Electric Arc Welder	Welder Trained. Only authorized / trained persons use welder. Earth cable adequately earthed to work. Electrode holder in good condition/safe Cables, clamps & lungs/connectors in good condition. Area in which welding machine is used is dry/protected from wet.

	Welder using correct PPE – eye/face/foot/body/respirator. Correct transparent screens & warning signs placed.
*Woodworking Machines	Operators Trained. Only authorized persons use machines. Provided with guards. Guards used. Operators using correct PPE – eye/face/feet/hearing Circular saws strictly operated according to prescribed methods and settings. Only prescribed saw blades (cross-cut, ripping blade, smooth cut, aluminium) shall be used for various applications
*Compressors	Relief valves correctly set and locked / sealed. Maximum Safe Working Pressure (MSWP) indicated on face of pressure gauge: not on glass cover. All drives adequately guarded. Receiver/lines drained daily Hoses good condition/clamped, not wired Compressed air NEITHER used to dust off clothing/PPE/and work areas NOR on bare skin
Concrete Mixer / Batch Plant	Top platform provided with guardrails. Dust abatement methods in use. Operators using correct PPE – eye / hands / respirators. All moving drive parts guarded. Emergency stops identified / indicated and accessible. Area kept clean/dry/and free from tripping and slipping hazards. Operators' overseer identified and crane signals displayed and used.
*Gas Welding / Flame Cutting Equipment	Only authorized/trained persons use the equipment. Torches and gauges in good condition. Flashback arrestors fitted at cylinders and gauges. Hoses in good condition/correct type / all connections with clamps Cylinders stored, used and transported in upright position, secured in trolley / cradle / to structure. All cylinders regularly checked for leaks, leaking cylinders returned immediately Fire prevention/control methods applied/hot work permits.

13.15 Plant & Storage Yards/Site Workshops Specifics

Subject	Requirements
Section 8(2)(1) General Machinery Regulation 2(1) Supervision of the Use & Maintenance of Machinery	Person/s with specific knowledge and experience designated in writing to Supervise the Use & Maintenance of Machinery Critical items of Machinery identified/numbered/placed on register/inventory Inspection/maintenance schedules for abovementioned Inspections/maintenance carried out to above schedules Results recorded
General Machinery Regulation 9(2): Notices re. Operation of Machinery	Schedule D Notice posted in Work areas
Vessels under Pressure Regulation 13(1)(b): Supervision of the Use & Maintenance of Vessels under Pressure (VuP)	Person/s with specific knowledge and experience designated in writing to Supervise the Use & Maintenance of VuP's VuP's identified/numbered/placed on register/Manufacturers plate intact Inspection/maintenance schedules for abovementioned Inspections/maintenance carried out to above schedules Results recorded/Test certificates available
Lock-out Procedure	Lock-out procedure in operation
Ergonomics	Ergonomics survey conducted – results on record Survey results applied
Demarcation & Colour Coding	Demarcation principles applied All services, pipes, electrical installation, stop-start controls,

	emergency controls etc. colour coded to own published or SABS standard Employees trained to identify colour coding
Portable & Bench Grinders	Area around grinder clear/trip/slip free Bench grinders mounted securely/grinder generally in good condition/No excessive vibration. On/Off switch/button clearly demarcated/accessible Adequate guards in place Tool rest – secure/square/max. 2 mm gap, perpendicular to drive shaft Stone/disk – correct type and size/mounted correctly/dressed Use of Eye protection enforced
Battery Storage & Charging	Adequately ventilated, ignition free room/area/no smoking sign/s Batteries placed on rubber/wooden surface Emergency shower/eye wash provided No acid storage in area Prescribed methods in place and adhered to when charging batteries
Ancillary Lifting Equipment	Chain Blocks/Tirfors/jacks/mobile gantries etc. identified/numbered on register Chains in good condition/links no excessive wear/checked daily Lifting books – throat pop marked/safety latch fitted SWL/MML marked/displayed
Presses/Guillotines/Shears	Only operated by trained/authorized persons Interlocks/lock-outs fitted/PPE worn or used at all times

13.16 Workplace Environment, Health and Hygiene

Subject	Requirement
*Lighting	Adequate lighting in places where work is being executed e.g. stairwells and basements. Light fittings placed / installed causing no irritating/blinding glare. Stroboscopic effect eliminated (not only reduced) where moving objects or machinery is used.
*Ventilation	Adequate ventilation / extraction / exhausting in hazardous areas e.g. chemicals / adhesives / welding / petrol or diesel / motors running and in confined spaces / basements.
*Noise	Tasks identified where noise levels exceeds 85 dB at any one time. All reasonable steps taken to reduce noise levels at the source. Hearing protection used where noise levels could not be reduced to below 85 dB.
*Heat Stress	Measures in place to prevent heat exhaustion in heat stress problem areas e.g. steel decks, when the WBGT index reaches 30. (See Environmental Regulation 4) Cold drinking water readily available at all times.
*Ablutions	Sufficient hygiene facilities provided – 1 toilet per 30 employees per sex (National Building Regulations prescribe chemical toilets for Construction sites) Toilet paper available. Sufficient showers provided. Facilities for washing hands provided Soap/cleaning agent available for washing hands Means of drying hands available Lock-up changing facilities / areas provided. Ablution facilities kept hygienic and clean
*Eating / Cooking Facilities	Adequate storage facilities provided. Weather protected eating area provided, separate from changing area Refuse bins with lids provided Facilities kept clean and hygienic.
*Pollution of	Measures in place to minimize dust generation.

Environment	Accumulation or littering of empty cement pockets, plastic wrapping / bags, packing materials etc. prevented. Spillage / discarding of oil, chemicals and dieseline into storm water and other drains or into existing or newly dug holes/cavities on site expressly prohibited.
*Hazardous Chemical Substances	All substances identified and list available e.g. acids, flammables, poisons etc. Materials Safety Data Sheets (MSDS) indicating hazardous properties and emergency procedures in case of incident on file and readily available. Substances stored safely. Expiry dates meticulously checked where applicable

SI 14 THE CONTRACTOR'S GENERAL DUTIES

The Contractor shall at all times ensure his status of an "employer" as referred to in the Act, and will abide by his/her responsibilities, duties and functions as per the requirements of the Act and Regulations with specific reference to Section 8 of the Act.

The Contractor shall keep, and on demand make available, a copy of the Act on site at all times and in addition to that he/she will introduce and maintain a file titled "Health and Safety File", or other record in permanent form, which shall contain all relevant aspects and information as contemplated in the Construction Regulations. He/she will make this file available to Department of Public Works or his representative whenever necessary or on request to an interested party.

SI 15 THE CONTRACTOR'S SPECIFIC DUTIES

The Contractor's specific duties in terms of these specifications are detailed in the Construction Regulations as published under government notice No. R1010 dated 18 July 2003.

The Contractor is specifically referred to the following elements of the Construction Regulations:

Regulation No. 1 - Definitions

Regulation No. 2 - Scope of application

Regulation No. 3 - Notification of construction work

Regulation No. 5 - Principal Contractor and Contractor

Regulation No. 6 - Supervision of construction work

Regulation No. 7 - Risk Assessment

Regulation No. 26 - Stacking & Storage on construction sites

Regulation No. 28 - Construction welfare facilities

Regulation No. 29 - Approved Inspection authorities

Regulation No. 30 - Offences and penalties

The list must not be taken to be exclusive or exhaustive!

The Contractor shall ensure compliance to the Act and its Regulations and specifically to the above regulations, and document each record in the Health and Safety File.

SI 16 THE CONTRACTOR'S SPECIFIC RESPONSIBILITIES WITH REGARD TO HAZARDOUS ACTIVITIES

The following activities are identifiable as hazardous in terms of the Construction Regulations.

The contractor shall execute the activities in accordance with the following Construction Regulations and other applicable regulations of the Act.

Regulation No. 8	-	Fall protection (Working on heights and in sub-ground level areas included)
Regulation No. 9	-	Structures
Regulation No. 10	-	Formwork and support work
Regulation No. 11	-	Excavation work
Regulation No. 12	-	Demolition work (Which is not foreseen for this project)
Regulation No. 13	-	Tunnelling
Regulation No. 14	-	Scaffolding
Regulation No. 15	-	Suspended platforms
Regulation No. 16	-	Boatswain's chairs
Regulation No. 17	-	Material hoists
Regulation No. 18	-	Batch plants
Regulation No. 19	-	Explosive powered tools
Regulation No. 20	-	Cranes
Regulation No. 21	-	Construction vehicles & mobile plant
Regulation No. 22	-	Electrical installations and machinery on construction sites
Regulation No. 23	-	Use and temporary storage of flammable liquids on construction sites
Regulation No. 24	-	Water environments
Regulation No. 25	-	Housekeeping on construction sites
Regulation No. 27	-	Fire precautions on construction sites

This limit must not be taken to be exclusive or exhaustive!

All of the above requirements will be read in conjunction with the relevant Regulations and Health and Safety standards as required by the Act. All documents and records required by the Construction Regulations will be kept in the Health and Safety File and will be made available at any time when required by Department of Public Works or his representative, or on request to an interested party.

SI 17 GENERAL NOTES TO THE CONTRACTOR

Legal Framework

Part of legal obligations

The more important Acts and relevant subordinate/secondary legislation as well as other (inter alia Local Government) legislation that also apply to the State as well as to State owned buildings and premises:-

(i) The latest issue of SABS 0142: "Code of practice for the Wiring of Premises"
(ii) The Local Government Ordinance or by-laws issued by the Local Authorities
(iii) The Fire Brigade Services Act 1987, Act 99 of 1987 as amended
(iv) The National Building Regulations and Building Standards Act 1977 (Act 103 of 1977) as amended and relevant proclaimed Regulations (SABS 0400)
(v) The Post Office Act 1958 (Act 44 of 1958) as amended
(vi) The Electricity Act 1984, Act 41 of 1984
(vii) The Regulations of Local Gas Board(s), including Publications of the SABS Standards and Codes of Practice, with specific reference to GNR 17468 dated 4th October 1997
(viii) Legislation pertaining to water usage and the environment
(ix) Legislation governing the use of equipment, which may emit radiation (e.g. X-Rays etc.) (Hazardous Substances Act, 1973 (Act 15 of 1973))
(x) Common Law

Legal Liabilities

Common Law and Legislation

Based on two main criteria –

- Would the reasonable person have foreseen the hazard?

  That is a reasonable person in that specific position, taking experience, qualifications, authority, position in the organization etc. into consideration

- Would the reasonable person have taken precautionary measures (action) to prevent or limit the hazard?

Negligence can be proven on failure on any or both of the above criteria

SI 18 HOUSEKEEPING

Good housekeeping will be maintained at all times as per Construction Regulation No. 25. Poor housekeeping contributes to three major problems, namely:

- costly or increased incidents,
- fire or fire hazards and
- reduction in production.

Good housekeeping will enhance production time and the statement of "A clean site is a safe site" was never proven wrong.

Particular emphasis is to be placed on the following crucial elements of a construction site:

- Phase priorities and production/plant layout
- Enclosures
- Pits, openings and shoring
- Storage facilities
- Effective, sufficient and maintained lighting or illumination
- Principal sources of injuries e.g. stairways, runways, ramps, loose building material
- Oil, grease, water, waste, rubble, glass, storm water
- Colour coding
- Demarcations
- Pollution
- Waste disposal
- Ablution and hygiene facilities
- First aid

The list must not be taken to be exclusive or exhaustive!

In promotion of environmental control all waste, rubble, scrap etc, will be disposed of at a registered dump site and records will be maintained. Where it is found to be impractical to use a registered dump site or it is not available, The Contractor will ensure that the matter is brought to record with Department of Public Works or his representative, after which suitable, acceptable alternatives will be sought and applied.

Dross and refuse from metals and waste matters or by-products which nature is such that they are poisonous or could pose a threat to living beings, shall be treated or disposed of by methods approved of by an inspector. Such matter shall be declared to the Department of Public Works and record of such removal of waste by an accredited waste removal contractor to a Government approved chemical waste site shall be documented and kept on file.

NOTE: No employer (Principal Contractor) shall require or permit any person to work at night or after hours unless there is adequate, suitable artificial lighting including support services in respect of Health and Safety.

SI 19 LOCKOUT SYSTEMS – ELECTRICAL

A system of control shall be established in order that no unauthorized person can energize a circuit, open a valve, or activate a machine on which people are working or doing maintenance, even if equipment, plant or machinery is out of commission for any period, thus eliminating injuries and damage to people and equipment as far as is reasonably practicable.

Physical/mechanical lock-out systems shall be part of the safety system and included in training. Lockouts shall be tagged and the system tested before commencing with any work or repairs.

A lockout systems register shall be kept and all lockouts are logged and discussed during the OHS Committee meetings.

Any lockout which could affect the daily operation of the Port of Entry, shall be communicated with the BCOCC Port Coordinator and such discussions shall be documented and kept with all lockout documents.

SI 20 INCIDENT INVESTIGATION

Inspection, reporting, proactive auditing and control measures are the best way in which a responsible contractor can control his area of responsibility in terms of occupational health and safety. All incidents therefore, irrespective of whether it gave rise to loss, injury, damage or not, shall be reported and investigated and the results recorded in the Health and Safety File. (GAR 9)

SI 20 GENERAL

The project under control of The Contractor shall be subject to periodic health and safety audits that will be conducted by Department of Public Works at intervals agreed upon between The Contractor and Department of Public Works, provided such intervals will not exceed periods of one month. The Contractor is to ensure that he/she and all persons under his control on the construction site shall adhere to the above specifications, as non-conformance will lead to Department of Public Works taking action as directed by Construction Regulation 4.1(e). The Contractor should note that he/she shall be held liable for any anomalies including costs and resulting deficiencies due to delays caused by non-conformance and/or non-compliance to the above Health and Safety Specifications and the Health and Safety Plan based on these specifications.

SI 21 IMPORTANT LISTS AND RECORDS TO BE KEPT

The following are lists of several records that are to be kept in terms of the Construction Regulations. The lists are:

1 List of appointments

2 List of record keeping responsibilities

3 Inspection checklist

These lists and documents are to be used as a point of reference to determine which components of the Act would be applicable to a particular site or task or project, as was intended under paragraph 1 ("Preamble") above.

1. LIST OF APPOINTMENTS

ITEM	REGULATION	APPOINTMENT	RESPONSIBLE PERSON
1.	4(1)(c)	Principal contractor for each phase or project	Client
2.	5.(3)(b)	Contractor	Principal Contractor
3.	5(11)	Contractor	Contractor
4.	6(1)	Construction supervisor	Contractor
5.	6(2)	Construction supervisor sub-ordinates	Contractor
6.	6(6)	Health and Safety Officer	Contractor
7.	7(1)	Person to Carry Out Risk Assessment	Contractor
8.	7(4)	Trainer/Instructor	Contractor
9.	8(1)(a)	Fall Protection Planner	Contractor
10	10(a)	Formwork & Support Work Supervisor	Contractor
11	10(e) + (f)	Formwork & Support Work Examiner	Contractor
12	11(1)	Excavation Supervisor	Contractor
13	11(3)(b)(ii)(b)	Professional Engineer or Technologist	Contractor
14	11(3)(k) & 12(11)	Explosives Expert (If needed)	Contractor
15	12(1)	Supervisor Demolition Work	Contractor
16	12(2) + (3)	Demolition Expert	Contractor
17	14(2)	Scaffold Supervisor	Contractor
18	15(1)	Suspended Platform Supervisor	Contractor
19	15(2)(c)	Compliance Plan Developer	Contractor
20	15(8)(c)	Suspended Platform Expert	Contractor
21	15(13)	Outrigger Expert	Contractor
22	17(8)(a)	Material Hoist Inspector	Contractor
23	18(1)	Batch Plant Supervisor	Contractor
24	18(7)	Batch Plant Operator	Contractor
25	19(2)(b)	Power Tool Expert	Contractor
26	19.2 (g)(i)	Power Tool Controller	Contractor
27	20(f)	Tower Crane Operator	Contractor
28	21(1)(d)(i)	Construction Vehicle and Mobile Plant Operator	Contractor
29	21(1)(j)	Construction Vehicle and Mobile Plant Inspector	Contractor
30	22(d)	Temporary Electrical Installations Inspector	Contractor
31	22(e)	Temporary Electrical Installations Controller	Contractor
32	26(a)	Stacking and Storage Supervisor	Contractor
33	27(h)	Fire Equipment Inspector	Contractor

2. LIST OF RECORD KEEPING RESPONSIBILITIES

ITEM	CR	RECORD TO BE KEPT	RESPONSIBLE PERSON
1	3(3)	Notification to Provincial Director – Annexure A Available on site	Principal Contractor
2	4(3)	Copy of Principal Contractor's Health & Safety Plan Available on request	Client
3	5(6)	Copy of Principal Contractor's Health & Safety Plan As well as each Contractor's Health & Safety Plan Available on request	Principal Contractor
4	5(7)	Health and Safety File opened and kept on site	Every Contractor

		(including all documentation required in terms of the Act & Regulations Available on request	
5	5(8)	Consolidated Health and Safety File handed to Client on completion on Construction work. To include all documentation required in terms of the Act & Regulations and records of all drawings, designs, materials used and similar information on the structure	Principal Contractor
6	5(9)	Comprehensive and Updated List of all Contractors on site, the agreements between the parties and the work being done Included in Health and Safety file and available on request	Principal Contractor
7	6(7)	Keep record on the Health and Safety File of the input by Construction Safety Officer [CR 6 (7)] at design stage or on the Health and Safety Plan	Contractor
8	7(2)	Risk Assessment – Available on site for inspection	Contractor
9	7(9)	Proof of Health and Safety Induction Training	Every Employee on site
10	8(3)	Construction Supervisor [CR 6(1)] has latest updated version of Fall Protection Plan [CR 8(1)]	Contractor
11	9(2)(b)	Inform contractor in writing of dangers and hazards relating to construction work	Designer of Structure
12	9(3)	All drawings pertaining to the design of structure On site available for inspection	Contractor
13	9(4)	Record of inspections of the structure [First 2 years – once every 6 months, thereafter yearly] – Available on request	Owner of Structure
14	9(5)	Maintenance records – safety of structure – Available on request	Owner of Structure
15	10(d)	Drawings pertaining to the design of formwork/support work structure – Kept on site, available on request	Contractor
16	11(3)(h)	Record of excavation inspection – On site available on request	Contractor
17	15(11)	Suspended Platform inspection and performance test records Kept on site available, on request	Contractor
18	17(8)(c)	Material Hoist daily inspection entered and signed in record book kept on the premises	Contractor
19	17(8)(d)	Maintenance records for Material Hoist – Available on site	Contractor
20	18(9)	Records of Batch Plant maintenance and repairs On site available for inspection	Contractor
21	19(2)(g)(ii)	Issuing and collection of cartridges and nails or studs (Explosive Powered Tools) recorded in register – recipient signed for receipt as well as return	Contractor
22	21(1)(j)	Findings of daily inspections (prior to use) of Construction Vehicles and Mobile Plant	Contractor
23	22(d)	Record of temporary electrical installation inspections [once a week] and electrical machinery [daily before use] in a register and kept on site	Contractor
24	27(*l*)	Fire Evacuation Plan	Contractor

3. INSPECTION CHECKLISTS

Employer Particulars	
Employer:	
Registered Name of Enterprise:	
Trade Name of Enterprise:	
Company Registration No.:	
SARS Registration No.:	
UIF Registration No.:	
COIDA Registration No.:	
Relevant SETA for EEA purposes:	
Industry Sector:	
Bargaining Council:	
Contact Person:	
Address of Premises:	
Postal Address:	
Telephone Number:	
Fax Number:	
E-mail Address:	
Chief Executive Officer:	
Chief Executive Officer Address:	
Competent Person:	
Maximum power demand: in KW	
Health and Safety Representatives:	
Activities, products manufactured and/ services rendered:	
Raw materials, materials and chemical/ biological substances:	
Total Number of Employees:	Male: Female:

Contractor Particulars	
CONTRACTOR NAME:	
WCA / FEMA NUMBER:	
H&S PLAN:	
RISK ASSESSMENTS:	
H&S FILE IS KEPT WHERE:	
CONTRACTS MANAGER:	
MANAGING DIRECTOR/CEO:	
COMPETENT PERSONS:	
OHSA 16.2 CEO DELEGATION	
CR14: SCAFFOLDING:	
CR15: SUSPENDED SCAFFOLDING:	
CR17(6): MATERIAL HOIST(S):	
CR18(1): BATCH PLANT:	
CR8(1)(A): FALL PROTECTION:	
CR11(1)(1): EXCAVATION WORK:	
CR12: DEMOLITION WORK:	
CR19(2)(B): EXPLOSIVE POWER TOOLS	
CR27(A): STACKING	

SECTION/REGS	INSPECTION ITEM CHECKED	N/A	YES	NO
	APPOINTMENTS			
CR6(1)	Supervisor:			
CR6(2)	Assistant Supervisor:			
S17(1)	Health & Safety Representative: (ratio)			
S19(1)	Health & Safety Committees			
CR 12(1)	Demolition Director			
	DOCUMENTS			
GAR 9(1)	Records of Incidents			
GAR 4	Copy of the Act			
GAR 7	Safety Reps Report			
GAR 8	Safety Committee Minutes			
DMR 18(7)	Lifting Machinery Log (Crane)			
CR 3(3)	Notification of Construction Work			
CR 7(2)	Risk Assessment			
CR 7(9)(e)	Proof of the Health & Safety Induction Training			
CR 11(13)(h)	Inspection of Excavation (Records)			
CR 20(g)	Crane Operator Medical Certificate			
CR 21(11)	Mobile Plant Operator Medical Certificate			
CR 18(9)	Batch Plant Repairs & Maintenance Records			
CR22(d)	Temporary Electrical Installation Record			
CR 5(7)	Health & Safety File			
CR 15(11)	Suspended Platforms' Performance Records			
CR 17(b) & (c)	Material Hoist Record Book			
IMPROV NOTICE	Scaffolding Log Book			
CR 21(1)(d)(ii)	Medical Certificate of Fitness			
CR 21(1)(l)	Construction Vehicle & Mobile Plant Register			
CR 22(d)	Electrical Installation & Machinery Register			
	INCIDENTS			
GAR 8(1) S24	Reported			
GAR 9(1)	Recorded Investigated Action Taken			
	PUBLIC SITE			
FR 2(1)	Sanitary Facilities			
CR 28(1)(c)	Changing Facilities for each sex			
CR 25(d)	Perimeter fence & no admittance			
CR 25(e)	Overhead protection netting/falling objects			
NB Notice	Pedestrian warning			
	PERSONAL SAFETY EQUIPMENT			
	Items Issued:			
GSR 2(3)	Items Required:			
S23	(What is the payment on each item?)			
	SAFETY PLANS			
	FIRST AID			
GSR 3(6)	Name(s) of First Aider(s):			
CR 4(1)(3)	Client's Health & Safety Specification			
CR5	Principal's contractor H&S Plan			
	FIRE HAZARD & PRECAUTIONS			
GSR 4	Flammables used, waste, hot work, diesel, fuel, gas			
ER 9(1)	Portable Extinguishers			
	ELECTRICAL INSTALLATIONS & MACHINERY			
CR22	Guarding & PPE to Electrical Installations			
	ILLUMINATION			
ER 3(6)	Dangerous Places and signage as well			
	HOUSEKEEPING			

ER6(2)(b),(c),(d)	Clear space storage			
ER6(3)	Disposal of waste			
	Good stacking practices			
	EXCAVATIONS			
CR 11(3)(1)	Barricades (plus illumination!)			
CR 11(3)(c)	Safe Depth Shoring/Bracing			
CR 11(1)(a)	Monitored			
CR 11(3)(h)	Excavation Inspection Record			
	GUARDING			
ER 6(2)(f)	Floor Openings (plus illumination!)			
	Floor slab sides, Shafts (plus illumination!)			
	SITE EQUIPMENT			
GSR 13A(a)	Ladders condition, secured			
IMPROV	Scaffold condition, secured			
	Platforms no. of boards condition Support 1.25. Toe Boards			
IMPROV	Hand Rails			
	SITE MACHINES			
DMR 3(2)(3)	Circulars, guards, riving knives			
DMR 2(a)	Mixers guarded			
	ELECTRIC POWER			
EMR 6(1)	Supply Board, condition E.L. Relay Test			
GMR 3(1)	Condition of Tools, Leads, Plugs, etc			
	LIFTING MACHINE/TACKLE			
DMR 18(8)	Lifting of persons			
DMR 18(8)	Condition, Securing of Load			
	EXPLOSIVE POWERED TOOLS			
CR 19(1)	Safe Use and Storage			
IMPROV	Warning Notice			
	Qualified operators and Inspector			
	ROOF WORK			
CR 8(1)	Safety equipment & precautions			
CR 8(2)	Fall protection plan			
CR 8(3)	Updated fall protection plan			
	ASBESTOS CEMENT (N/A)			
	Accredited Service provider appointed			

WARNING: Under no circumstances shall any work of any nature whatsoever on any ASBESTOS material be undertaken unless the work is entrusted and mandated to a 'REGISTERED ASBESTOS CONTRACTOR" in terms of the Asbestos Regulations. [CR 12(9)] (Contact the Regional Manager's Office)

SI 22 HEALTH AND SAFETY FILE COMPILATION AND CONTENT

The safety file shall be compiled with the following sections and contents

Section	Contents
A.	Site Information, Sub-Contractors, Agreements, Suppliers, Drawings
B.	Policies & Site Rules
C.	Department Labour Notification, Other Notices
D.	Health and Safety Plan, Risk Assessment, HIRA, Safe Work Procedures
E.	Emergency Planning and First Aid
F.	Site Safety Induction, Training, Certificates
G.	Appointments, Health and Safety Committee
H.	Registers
I.	OHS Reps Inspection Reports and Audits
J.	Incident Reporting and Investigations
K.	Committee Meeting Agendas and Minutes
L.	Toolbox Talks
M.	Workplace Facilities and Hygiene
N.	Personal Protective Equipment
O.	Lifting Machinery and Equipment
P.	Moving Machinery, Plant and Vehicles
Q.	Hot Work Permits and Equipment
R.	Excavation
S.	Demolition
T.	Working on Heights, Ladders and Scaffolding
U.	Hazardous and Substances and Environmental Issues
V.	Medical Reports and Personal Files
W.	Correspondence
X	Legal Documentation

SI 23 SAFETY AND SWITCHING PROCEDURES FOR ELECTRICAL INSTALLATIONS

a. Notwithstanding the provisions contained in the Electrical Installation Regulations promulgated by Government Notice No.R.2920 of 23 October 1992 and the Electrical Machinery Regulations promulgated by Government Notice No. R.1953 of 12 August 1988, respectively, as amended, a contractor shall ensure that –

(a) before construction commences and during the progress thereof, adequate steps are taken to ascertain the presence of and guard against danger to workers from any electrical cable or apparatus which is under, over or on the site;

(b) all parts of electrical installations and machinery are of adequate strength to withstand the working conditions on construction sites;

(c) in working areas where the exact location of underground electric power lines is unknown, employees using jackhammers, shovels or other hand tools which may make contact with a power line, are provided with insulated protective gloves or otherwise that the handle of the tool being used is insulated;

(d) all temporary electrical installations are inspected at least once a week and electrical machinery on a daily basis before use on a construction site by competent persons and the records of these inspections are recorded in a register to be kept on site; and

(e) the control of all temporary electrical installations on the construction site is s designated to a competent person who has been appointed in writing.

Health and Safety File Requirements

A	Site Information, Sub-Contractors, Agreements, Suppliers, Drawings
B	Policies & Site Rules
C	Department Labour Notification, Other Notices
D	Health and Safety Plan, Risk Assessment, Safe Work Procedures
E	Emergency Planning and First Aid
F	Site Safety Induction, Training, Certificates
G	Appointments, Health and Safety Committee
H	Registers
I	OHS Reps Inspection Reports and Audits
J	Incident Reporting and Investigations
K	Committee Meeting Agendas and Minutes
L	Toolbox Talks
M	Workplace Facilities and Hygiene
N	Personal Protective Equipment
O	Lifting Machinery and Equipment
P	Moving Machinery, Plant and Vehicles
Q	Hot Work Permits and Equipment
R	Excavation
S	Demolition
T	Working on Heights, Ladders and Scaffolding
U	Hazardous and Substances and Environmental Issues
V	Medical Reports and Personal Files
W	Correspondence
X	Legal Documentation

OHS Act Site Evaluation

Month:	Site:	Contractor:
Done by:	Total Score % 0.00%	

Score:	N/A = 3	Comply = 3	Comply partly = 1	Non-compliant = 0	Total Points	Total Scored
					318	0

1. Subcontractors & Agreements	0
1.1 Is a signed copy of the Client's appointment on site?	
1.2 Are subcontractors correctly appointed?	
1.3 Do the subcontractors have a safety file on site?	
1.4 Is the 37.2 signed by both parties?	
1.5 Has the appointments and controlling documents been approved by the principal contractor?	
2. Policies and Site Rules	**0**
2.1 Is the health and safety policy signed and communicated with all employees?	
2.2 Is the HIV/AIDS policy displayed and communicated with all?	
2.3 Are the sate safety rules communicated with all on site?	
3. Department of Labour and Legal Issues	**0**
3.1 Is proof of notification of construction work on file?	
3.2 Is the letter of good standing on file and current?	
3.3 Is the contractor's Public Indemnity Insurance on file and valid?	
3.4 Is the OHS Act displayed or available?	
3.5 Is the Construction Regulations available?	
4. Safety Plan and Risk Assessments	**0**
4.1 Is the contractors Health and Safety Plan on file and site specific?	
4.2 Has Risk Assessments been conducted for this project?	
4.3 Has Risk Assessments been communicated with employees?	
4.4 Are daily safety talks conducted?	
5. Emergency Planning & First Aid	**0**
5.1 Is there a site specific emergency plan?	
5.2 Is there a Regulation 3 first aid kit on site?	
5.3 Is the first aider's name and tel. Nr. available	
5.4 Is the first aider's certificate still valid?	
5.5 Dressing record available?	
5.6 Emergency number displayed	
6. Site Safety Induction and other training	**0**
6.1 Have all employees received site safety induction training?	
6.2 Have all employees received HIV/AIDS training?	
6.3 Are the supervisor's competency certificates available on site?	
7. Appointments	**0**
7.1 Has the 16.2 assignment been documented and signed?	
7.2 Supervisor appointment	
7.3 Qualified Supervisor	
7.4 Qualified Safety Officer	
7.5 Safety Representative	
7.6 Qualified Risk Assessor	
7.7 All other appointments as required	
7.8 Organogram displayed?	

8. Registers	0
8.1 DB Box (Nr's and ID)	
8.2 Fire Equipment	
8.3 Ladders	
8.4 Scaffolding	
8.5 Excavation	
8.6 Form & Support work	
8.7 Portable electrical tools	
8.8 Hand tools	
8.9 PPE	
8.10 Cranes, Lifting Machines	
8.11 Lifting tackle and equipment	
8.12 Construction vehicles	
8.13 Hazardous chemicals	
8.14 Compacting machines	
8.15 Concrete mixer	
8.16 Housekeeping	
8.17 Safety Harness	
8.18 Ropes and Slings	
9. Audits and Inspections	**0**
9.1 Safety Rep inspections	
9.2 Monthly audit reports	
10. Incident Management	**0**
10.1 Letter of good standing valid?	
10.2 WCL2,WCL3, WCL5 on file	
10.3 Annexure 1 & 2 on file	
10.4 Incident report procedure on file	
10.5 Are all incidents investigated?	
10.6 Have a training session been conducted to address incidents and lessons learnt?	
11. H&S Committee meetings and safety minutes	**0**
11.1 Safety meetings minuted with rectification plan?	
11.2 Are issues discussed addressed with deadlines?	
11.3 Agendas address site specifics?	
12. Safety Awareness	**0**
12.1 Toolbox talks done weekly?	
12.2 One-to-one safety talks on file?	
12.3 Posters displayed	

13. Facilities and Hygiene	0
13.1 Showers available?	
13.2 Toilets available?	
13.3 Toilet paper available?	
13.4 Are facilities clean?	
13.5 Is clean cool drinking water available?	
14. Personal Protective Equipment (PPE)	**0**
14.1 Have the PPE register been completed?	
14.2 Are all PPE in a good condition?	
14.3 Is PPE available for visitors?	
15. Lifting Machinery and Mobile Equipment	**0**
15.1 Do all lifting equipments have a load test certificate?	
15.2 Are all lifting equipment numbered and registered?	
15.3 Has a lifting equipment inspector been appointed?	
15.4 Has lifting machinery been equipped with lightning free footplates?	
15.5 Have all operators a certificate of competence?	
15.6 Have all operators done a medical fitness evaluation?	
15.7 Are all machinery free of oil or fuel leaks?	
15.8 Machinery does not generate excessive smoke or noise?	
15.9 Do all vehicles and mobile plant have a fire extinguisher?	
15.10 Is a pre-start checklist available and completed each day?	
16. Hot Work	**0**
16.1 Are hot work equipment tested and registered?	
16.2 Is a hot work register available?	
16.3 Is a person trained to issue a hot work permit?	
16.4 Are isolation and barricading used during hot work?	
17. Excavation and shoring	**0**
17.1 Is an excavation inspector appointed?	
17.2 Are excavations inspected before and after work daily?	
17.3 Are excavations barricaded correctly?	
18. Demolition and Explosives	**0**
18.1 Is a qualified Demolition Supervisor appointed?	
18.2 Is a qualified Blaster appointed?	
18.3 Are safety talks done before demolition work starts?	
18.4 Are explosives handled according to the Explosives Act?	
19. Working on Heights	**0**
19.1 Are all employees working on heights tested Physically and Psychologically?	
19.2 Has a qualified fall protection plan developer been appointed?	
19.3 Has all applicable employees received training on fall arrest equipment?	
19.4 Are all ladders been registered and in good condition?	
19.5 Are all open areas or holes been barricaded?	

20. Hazardous Chemicals & Environmental Issues	0
20.1 Is a list available indicating all hazardous substances on site?	
20.2 Are MSDS for each on site?	
20.3 EMP on site?	
20.4 Waste Management plan on site?	
20.5 Hazardous Waste removal?	
20.6 Environmental talks?	

General Comments

The Principal contractor must within three (3) working days report to the Client's Agent on how he/she will rectify any deviances.
Any non-compliance can result in work stopages

Signature and Date

ADDITIONAL SPECIFICATION

SN IMPLEMENTATION OF LABOUR-INTENSIVE INFRASTRUCTURE PROJECTS UNDER THE EXPANDED PUBLIC WORKS PROGRAMME (EPWP)

CONTENTS

SN 01 SCOPE

This project is part of the Expanded Public Works Programme and aims to alleviate and reduce unemployment. EPWP will achieve this aim through the provision of work opportunities as part of the project. EPWP workers will be recruited and trained in skills relevant to the work to be done on this project. These workers will be employed by the Contractor as part of this project so that they can gain work experience on these projects. The Contractor will be required to manage, supervise and report on the EPWP workers, monthly, for a period of 36 months. Furthermore the Contractor will be required to supervise these EPWP workers to ensure that the work they perform is of the required standard.

Labour-intensive infrastructure projects under the EPWP include:

- using labour intensive construction methods to provide employment opportunities to local unemployed people;
- providing training or skills development to those locally employed workers;
- building cost-effective and quality assets.

The employment of locally employed temporary workers on all EPWP labour-intensive infrastructure projects must be in accordance with the Code of Good Practice for Employment and Conditions for Expanded Public Works Programmes issued in terms of the Basic Conditions of Employment Act, 1997 (Act N°75 of 1997)..

SN 02 TERMINOLOGY AND DEFINITIONS

SN 02.01 TERMINOLOGY

(a)	BY HAND	refers to the use of tools which are manually operated and powered.
(b)	EPWP	Expanded Public Works Programme, a National Programme of the government of South Africa, approved by Cabinet.
(c)	DOL	Department of Labour.
(d)	Labour-intensive	refers to methods of construction involving a mix of machines and labour, where labour, utilising hand tools and light plant and equipment, is preferred to the use of heavy machines, where technically and economically feasible.(Note: The normal emphasis on the cost-effectiveness and quality of the asset must be retained.)
(e)	Public body	refers to a department, trading entity, constitutional institution, municipality, public entity or municipal entity
(f)	Scope of work	refers to a specification and description of the services or construction works which are to be provided and any other requirements and constraints relating to the manner in which the contract is to be performed

SN 02.02 DEFINITIONS

(a)	"employer"	means the contractor or any party employing the worker under the EPWP Programme.
(b)	"client"	means the Department of Public Works.
(c)	"worker"	means any person working or training in an elementary occupation on a EPWP.

SN 03 APPLICABLE LABOUR LAWS

In line with the Expanded Public Works Programme (EPWP) policies, the Code of Good Practice for Employment and Conditions of Work for Expanded Public Works Programmes read in conjunction with a Ministerial Determination for Expanded Works Programmes issued by the Minister of Labour in terms of Section 50(1) of the Basic Conditions of Employment Act of 1997 of which extracts have been reproduced below in clauses SN 04, shall apply to works described in the scope of work and which are undertaken by unskilled or semi-skilled workers.

SN 04 EMPLOYMENT OF UNSKILLED AND SEMI-SKILLED WORKERS IN LABOUR INTENSIVE WORKS

SN 04.01 REQUIREMENTS FOR THE SOURCING AND ENGAGEMENT OF LABOUR

The beneficiaries of the programmes should be locally-based (as close to the project site as possible) individuals prepared to work on the specific EPWP.

In order to spread the benefits as broadly as possible in the community, a maximum of one person per household should be employed, taking local available labour into account.

Workers from other areas may be employed if they have skills that are required for a project and there are not enough persons in the local communities who have those skills or who could undergo appropriate skills training. However, workers from other communities should not exceed 20% of all persons working on a programme. A proper skills audit should be conducted, where possible, in an area where an EPWP is in operation.

Programmes should set participation targets for employment with respect to women, youth, and people with disabilities.

The proposed targets are:

- 55% women;
- 40% youth from 16 to 35 years of age; and

- 2% people with disabilities.

EPWPs should seek to achieve these targets in all occupational categories.

Persons under sixteen years of age may not be employed on EPWP.

SN 04.02 SPECIFIC PROVISIONS PERTAINING TO SANS 1914-5

Definitions

Targeted labour: Unemployed persons who are employed as local labour on the project.

Contract participation goals

- The specified contract participation goal for the contract is stated in the Scope of Works. The contract participation goal shall be measured in the performance of the contract to enable the employment provided to targeted labour to be quantified.
- The wages and allowances used to calculate the contract participation goal shall, with respect to both time-rated and task rated workers, comprise all wages paid and any training allowance paid in respect of agreed training programmes.
- Further to the provisions of clause 3.3.2 of SANS 1914-5, written contracts shall been entered into with targeted labour.
- The definition for net amount shall be amended as follows:
- Financial value of the contract upon completion, exclusive of any value added tax or sales tax which the law requires the employer to pay the contractor.

SN 05 TRAINING OF EPWP WORKERS

The contractor shall provide all the necessary on-the-job training to targeted labour to enable such labour to master the basic work techniques required to undertake the work in accordance with the requirements of the contract in a manner that does not compromise worker health and safety.

SN 06 CONTRACTUAL OBLIGATIONS IN RELATION TO LABOUR

The EPWP workers to be employed in the programme (EPWP) shall be directly contracted to the Contractor. Over and above the construction and project management responsibilities, the contractor will be expected to perform the tasks and responsibilities as set out in this specification.

SN 07 PAYMENT OF WORKERS

Employers must pay workers at least the minimum rate as stipulated in the Ministerial Determination: Expanded Public Works Programme

Workers can be paid on the basis of the number of tasks completed. These workers are referred to as "task-rated workers". Alternatively, workers can be paid on a daily rate.

There are jobs where it is not possible to pay workers on the basis of tasks performed. These workers must be paid on the basis of the amount of time they worked. They are referred to as "time-rated workers".

On the task-based system, a worker is paid for each task completed or part thereof.

If workers are informed a day before that work will not take place the next day, they should not be entitled to any payment.

Workers will be paid a training allowance in case they are required to attend agreed training programmes. This should be equal to 100% of the daily task rate for task-rate workers or 100% of the daily rate of pay for time-rated workers. All the costs of training will be covered, for example, travel, trainers, material, tuition fees.

Where a worker participates in a learnership, the relevant learnership determination must be used to determine the training allowance whilst on training.

Each worker must be given written particulars of employment and verbal explanations in an appropriate language of their rate of pay and how this is to be calculated.

Where a project is completed earlier than anticipated the worker should receive the full agreed remuneration for the stipulated period of the contract if the pay for the task was to be calculated on the basis of time. Where such work was to be performed on a task-based system, the full agreed remuneration for the task should be paid for early completion.

SN 08 GENERIC LABOUR INTENSIVE SPECIFICATION

The Generic Labour-intensive specification below is the same as SANS 1921-5, Construction and management requirement for works contracts- Part 5: Earthworks activities which are to be performed by hand and should be included in the scope of works without amendment or modification as set out below.

Scope

This specification establishes general requirements for activities which are to be executed by hand involving the following:

a) trenches having a depth of less than 1.5 metres

b) stormwater drainage

c) low-volume roads and sidewalks

Precedence

Where this specification is in conflict with any other standard or specification referred to in the Scope of Works to this Contract, the requirements of this specification shall prevail.

Hand excavateable material

Hand excavateable material is material:

a) granular materials:

i) whose consistency when profiled may in terms of table 1 be classified as very loose, loose, medium dense, or dense; or

ii) where the material is a gravel having a maximum particle size of 10mm and contains no cobbles or isolated boulders, no more than 15 blows of a dynamic cone penetrometer is required to penetrate 100mm;

b) cohesive materials:

i) whose consistency when profiled may in terms of table 1 be classified as very soft, soft, firm, stiff and stiff / very stiff; or

ii) where the material is a gravel having a maximum particle size of 10mm and contains no cobbles or isolated boulders, no more than 8 blows of a dynamic cone penetrometer is required to penetrate 100mm;

Note:

1) *A boulder, a cobble and gravel is material with a particle size greater than 200mm, between 60 and 200mm.*
2) *A dynamic cone penetrometer is an instrument used to measure the insitu shear resistance of a soil comprising a drop weight of approximately 10 kg which falls through a height of 400mm and drives a cone having a maximum diameter of 20mm (cone angle of 60°with respect to the horizontal) into the material being used.*

Trench excavation

All hand excavateable material in trenches having a depth of less than 1,5 metres shall be excavated by hand.

Compaction of backfilling to trenches (areas not subject to traffic)

Backfilling to trenches shall be placed in layers of thickness (before compaction) not exceeding 100mm. Each layer shall be compacted using hand stampers

a) to 90% Proctor density;

b) such that in excess of 5 blows of a dynamic come penetrometer (DCP) is required to penetrate 100 mm of the backfill, provided that backfill does not comprise more than10% gravel of size less than 10mm and contains no isolated boulders, or

c) such that the density of the compacted trench backfill is not less than that of the surrounding undisturbed soil when tested comparatively with a DCP.

Excavation

All hand excavateable material including topsoil classified as hand excavateable shall be excavated by hand. Harder material may be loosened by mechanical means prior to excavation by hand.

The excavation of any material which presents the possibility of danger or injury to workers shall not be excavated by hand.

Clearing and grubbing

Grass and small bushes shall be cleared by hand.

Shaping

All shaping shall be undertaken by hand.

Loading

All loading shall be done by hand, regardless of the method of haulage.

Haul

Excavation material shall be hauled to its point of placement by means of wheelbarrows where the haul distance is not greater than 150 m.

Offloading

All material, however transported, is to be off- loaded by hand, unless tipper-trucks are utilised for haulage

Spreading

All material shall be spread by hand.

Compaction

Small areas may be compacted by hand provided that the specified compaction is achieved.

Grassing

All grassing shall be undertaking by sprigging, sodding, or seeding by hand.

Stone pitching and rubble concrete masonry

All stone required for stone pitching and rubble concrete masonry, whether grouted or dry, must to be collected, loaded, off loaded and placed by hand.

Sand and stone shall be hauled to its point of placement by means of wheelbarrows where the haul distance is not greater than 150m.

Grout shall be mixed and placed by hand.

Manufactured Elements

Elements manufactured or designed by the Contractor, such as manhole rings and cover slabs, precast concrete planks and pipes, masonry units and edge beams shall not individually, have a mass of more than 320kg. In addition the items shall be large enough so that four workers can conveniently and simultaneously acquire a proper hand hold on them.

Roads

The following operations may be carried out using labour intensive methods:

1. Site clearance
2. Layer work construction including loading, hauling and spreading material.

Note: All compaction should be done using conventional compaction equipment and where necessary the use of heavy machinery may be employed to loosen material for excavation by hand. Where significant use of blasting is indicated, then the Works are probably not suitable for labour intensive methods.

3. Where higher standards of roads are to be constructed then the following operations may be included:

- Macadam base course either dry, water bound or emulsion bound; foamed bitumen gravel; emulsion treated gravel; or slurry bound or composite macadams.
- Application of bitumen bound surface treatment (cold) including spreading and dragging of chips.
- Slurry treatments to existing or new road surfaces.
- In situ concrete roads

- Segmented block paved roads.
- Cast in-situ block pavements (hyson-cells);
- Road markings.

4. Fencing.
5. Erection of road signs.
6. Grass maintenance.
7. Road reserve maintenance.
8. Rubble masonry bridges, culverts and retaining walls

Stormwater

The following operations may be constructed using labour intensive construction methods:

1. Gabions and reno mattresses.
2. Small diameter pre-cast concrete elements (pipes and arches).
3. Grassed or lined water channels

Sewers

The following operations may be constructed using labour intensive construction methods:

1. Sewer manholes either in brickwork or using specially manufactured pre-cast manhole rings (individual mass less than 320kg).
2. Sewer manhole covers and lids using specially designed pre-cast units.
3. Maturation or flocculation ponds with least dimension not exceeding 100m.

Water

The following operations may be constructed using labour intensive construction methods:

1. Laying of water pipelines, fittings and house connections in all materials (including steel) where the mass of individual pipe lengths does not exceed 320kg.
2. Construction of ferro-cement reservoirs.
3. Excavation for membrane lined and floating roof reservoirs.
4. Construction of small masonry reservoirs.
5. Spring and well protection measures

Haul of Material

Where the haul of any material exceeds 200m, consideration should be given to the use of local resources for transporting material. This includes the use of animal drawn vehicles and small trailer combinations utilising locally sourced tractors. All loading and off loading can be done by hand.

Electricity

The following operations may be constructed using labour intensive methods:

1. Excavation of trenches for reticulation of all voltages.
2. Excavation for and erection of poles for overhead lines.
3. Installation of all electricity cables (joints and terminations by qualified persons).

Bill of quantities

Labour-intensive works is highlighted in the bills of quantities for the payment items relating to labour-intensive works **(LI)**.

SN09 REPORTING

The Consultant shall, before certifying a contractor's payment certificate, ensure that the contractor has submitted labour information in a format and timeframe specified by the employer. If the information submitted by the contractor is inadequate the consultant shall not submit the payment certificate to the employer for payment.

The Contractor's payment invoices shall be accompanied by labour information for the corresponding period in a format specified by the employer. If the contractors chooses to delay submitting payment invoices, labour returns shall still be submitted as per frequency and timeframe stipulated by the Employer. The contractor's invoices shall not be paid until all pending labour information has been submitted.

ADDITIONAL SPECIFICATION

SS SITE SPECIFIC INVENTORY

CONTENTS

SS 01 SCOPE

This Additional Specification (**SS: Site Specific Inventory**) covers the inventory of the Monantsa Pass and Peka Bridge Ports of Entry included as part of the contract in order to assist the Contractor with the scope of work regarding specific maintenance requirements, development of a maintenance control plan, site maintenance administration and preventative maintenance performance.

Additional Specification SS: Site Specific Inventory, should be read in conjunction with all other technical, particular and additional specifications applicable to this contract.

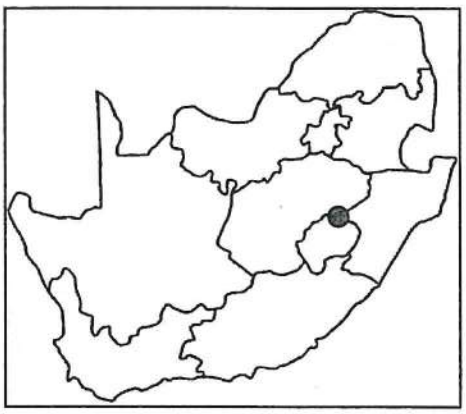
The routine maintenance work to be performed and executed shall include, but not be limited to the items listed in this specification.

SS 02 SITE LOCALITY INFORMATION

Due to the size and remote locations of the Monantsa Pass and Peka Bridge Ports of Entry, the Contractor should also refer to Additional Specification SA: General Maintenance regarding the frequency of site visits relating to preventative maintenance.

SS 02.01 MONANTSA PASS PORT OF ENTRY

Monantsa Pass Port of Entry is situated on the Free State / Lesotho border. The total size of the buildings on Monantsa Pass is 306m^2 covering a site area of ±5 790m^2. The Port of Entry services approximately 145 visitors per day on average. The Port of Entry has ESKOM electricity with a standby generator to support the Administration building and essential services. Water is supplied from Maluti-a-Phofoeng municipality, and sewer is handled by septic tank systems.



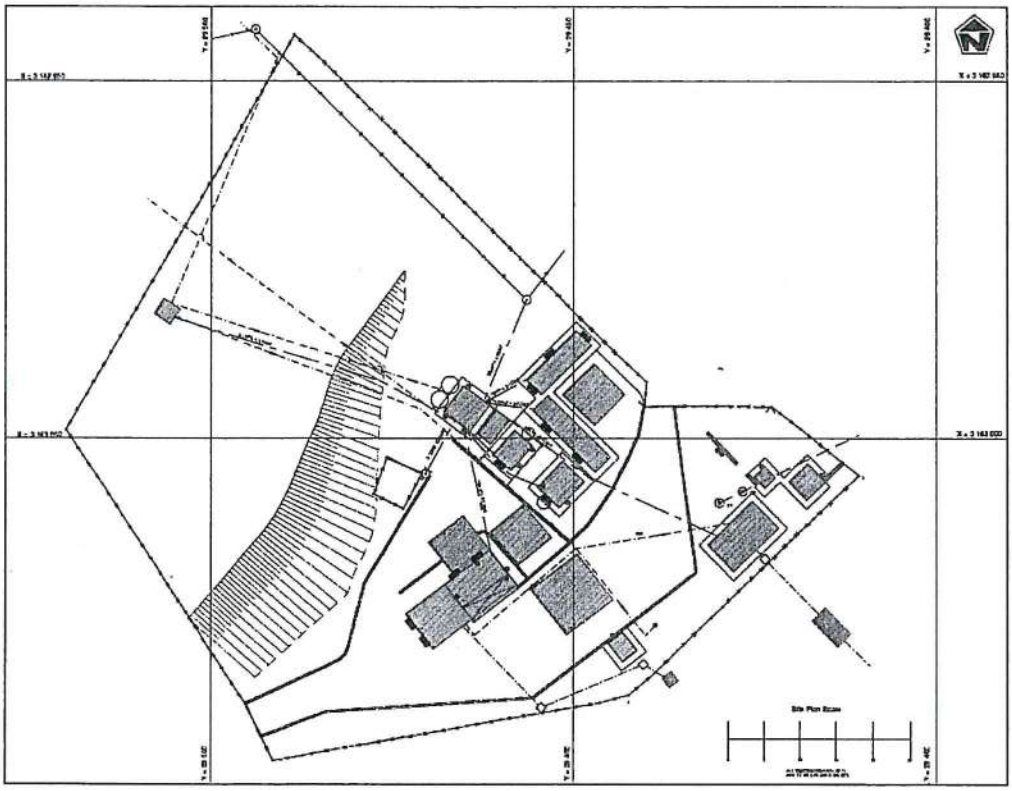
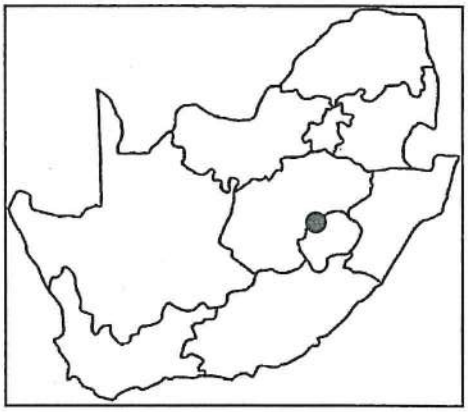


Figure 2.1: Monantsa Pass Port of Entry: Site Layout

The contract at the Monantsa Pass Port of Entry comprises of maintenance and servicing work as specified in **PG-01.1 (EC) Scope of Works**.

SS 02.02 PEKA BRIDGE PORT OF ENTRY

Peka Bridge Port of Entry is situated on the Free State / Lesotho border. The total size of the buildings on Peka Bridge is 1618m^2 covering a site area of ±51 950m^2. The Port of Entry houses approximately 14 permanent personnel, and services about 120 visitors per day on average. The Port of Entry has ESKOM electricity with a standby generator to support the Administration building and essential services. Water is supplied from a borehole on the premises, and sewer is handled by septic tank systems.



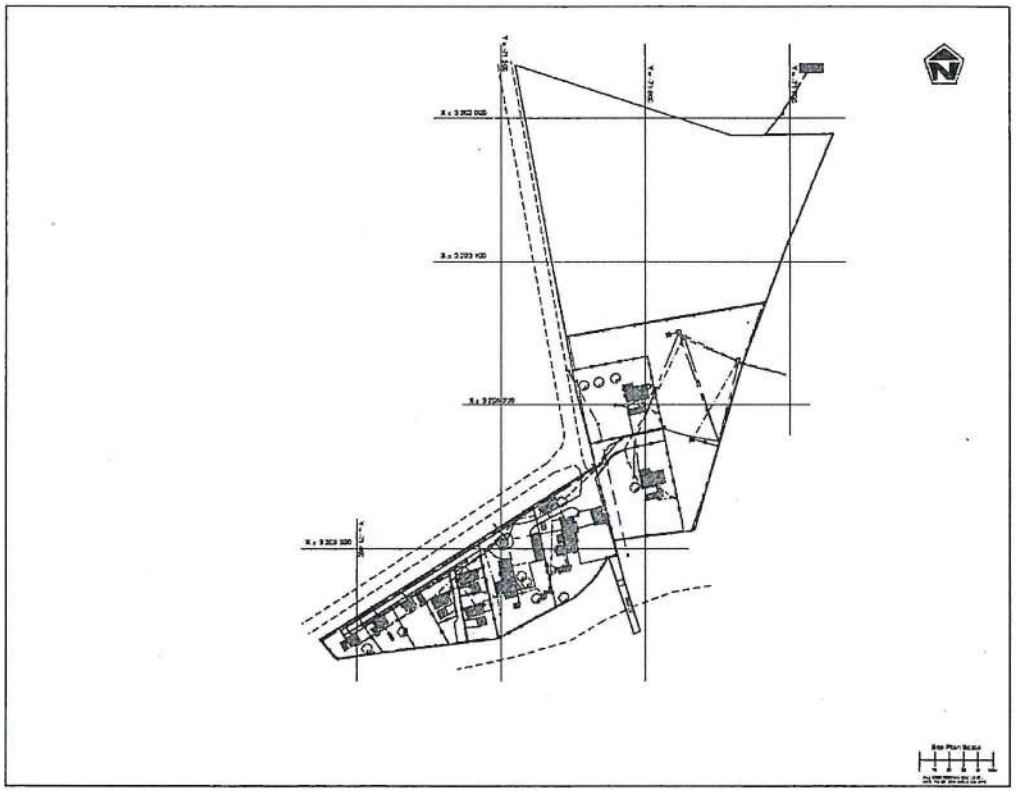


Figure 2.2: Peka Bridge Port of Entry: Site Layout

The contract at the Peka Bridge Port of Entry comprises of maintenance and servicing work as specified in **PG-01.1 (EC) Scope of Works**.

SS 03 DESIGN STANDARDS AND DEFINITIONS

PW371	Department of Public Works Specification: Specification of Materials and Methods to be used	
PW350	Department of Public Works Specification: Facilities for Disabled Persons	
PW347	Department of Public Works Specification: Civil Engineering Manual	
SANS (various)	South African Bureau of Standards: National Standards	
COLTO	Committee of Land Transport Officials: Standard Specifications for Road and Bridge Works for State Road Authorities (1998 edition)	
GCC	General Conditions of Contract for works of civil engineering construction (1st edition 2004)	
EPWP	Expanded Public Works Programme	
Pluming Fixtures	Plumbing points such as toilets, wash hand basins, showers, sinks, taps, etc.	
Electrical Fixtures	Electrical points such as lights, socket outlets, light switches, isolators; etc.	
Call Centre	The National RAMP Call Centre	
Colours (standardised)	External plastered walls:	Colour to be confirmed
	Internal plastered walls:	Colour to be confirmed
	Steelwork:	White
	Ceilings:	White
	Window frames:	White
	Doors and frames:	Colour to be confirmed
	Roofs:	Green

SS 04 SITE INVENTORY

SS 04.01 MONANTSA PASS PORT OF ENTRY

The installations to be maintained under the repair, maintenance and servicing contract at Monantsa Pass Port of Entry shall consist of:

1. **Plumbing, drainage and wet services**
   - 9 Buildings: 306m^2
   - 34 Plumbing fixtures
   - 2 Geysers

2. **Building Electrical**
   - 37 Socket Outlets
   - 17 Light Switches
   - 43 Light Fittings

3. **Fencing, Cleaning and Site Keeping**
   - 345m fencing
   - Cleaning of ablutions, offices and support buildings: 306m^2
   - Site keeping of 5 790 m^2

4. **External water and Sewer reticulation**
   - 14kl water storage tank
   - Water distribution network
   - Septic tanks
   - Sewer network
   - Pentax CM 080/1 water pump

5. **Roads and Storm water drainage**
   - 1362 m^2 paved areas

6. **Standby Power**
   - 75kVA standby generator

7. **External Lighting**
   - 4 area lights

8. **Heating, ventilation and air-conditioning systems**
   - 11 Air-Conditioners

9. **Conventional fire fighting equipment**
   - 20 Fire extinguishers

SS 04.02 PEKA BRIDGE PORT OF ENTRY

The installations to be maintained under the repair, maintenance and servicing contract at Peka Bridge Port of Entry shall consist of:

1. **Plumbing, drainage and wet services**
   - 8 Houses: 901m^2
   - 4 Buildings: 718m^2
   - 210 Plumbing fixtures
   - 12 Geysers

2. **Building Electrical**
   - 8 Houses: 901m^2
   - 4 Buildings: 718m^2
   - 195 Socket Outlets
   - 175 Light Switches
   - 164 Light Fittings

3. **Fencing, Cleaning and Site Keeping**
   - 2 272m fencing
   - Cleaning of ablutions, offices and support buildings: 718m^2
   - Site keeping of 51 950 m^2

4. **External water and Sewer reticulation**
   - 2 x 21kl water storage tank
   - Water distribution network
   - Septic tanks
   - Sewer network
   - Boreholes and river sump pump
   - 2 x Submersible borehole pumps
   - 1 x Raw water river pump
   - 2 x Pentax 160/01 settling tank pumps
   - 1 x Pentax 210/01 filtration pump

5. **Roads and Storm water drainage**
   - 3 399 m^2 surfaced roads

6. **Standby Power**
   - 130kVA standby generator

7. **External Lighting**
   - 8 Street lights
   - 33 perimeter lights
   - 4 kiosks

8. **Heating, ventilation and air-conditioning systems**
   - 21 Air-Conditioners

9. **Conventional fire fighting equipment**
   - 44 Fire extinguishers

Operation of the water treatment plant shall be performed by the contractor at the Peka Bridge Port of Entry.

SS 05 LOCATION OF PORTS OF ENTRY

The Ports of Entry included in this contract are located at the positions indicate below:

- Monantsa Pass Port of Entry is located on the Free State / Lesotho border approximately 42km south of Kestell in the Free State Province (GPS - S 28° 34.92' E 28° 41.93')
- Peka Bridge Port of Entry is located on the Free State / Lesotho border approximately 19km east of Clocolan in the Free State Province (GPS - S 28° 56.68' E 27° 44.07')

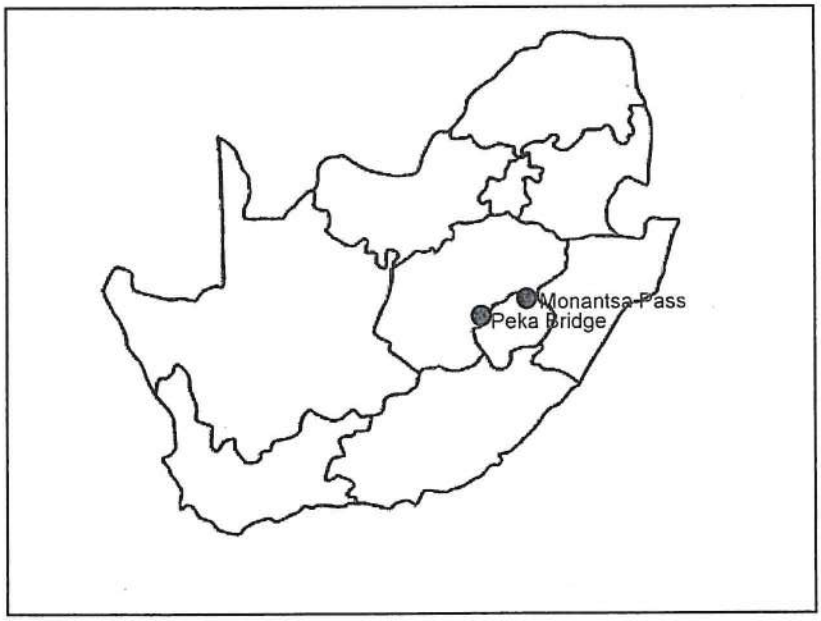


Figure 5.1: Location of Monantsa Pass & Peka Bridge Ports of Entry

SS 06 SCOPE DEFINITION

The description of the works given above is not necessarily complete and shall not limit the work to be carried out by the Contractor under this contract.

Approximate quantities of each type of work are given in the contract Schedule of Quantities.

SS 07 ADDITIONAL SITE SPECIFIC INFORMATION

Additional site specific information, including asset inventory list, site specific information, bulk water and sewer installations, ablution facilities and maintenance and operational manuals (where available) are attached to this Additional Specification SS: Site Specific Inventory.

SS 07.01 **EXTEND OF FACILITY ASSETS**

NO	INSTALLATION	MONANTSA PASS PORT OF ENTRY
7.1	BUILDINGS	0 residential buildings
		9 operational buildings of 306 m^2
7.2	SANITARY AND BRASSWARE	16 Taps and valves
		7 WC Pans and Cisterns
		2 Urinals including junior flush masters
		7 Wash hand basins and sink units
		0 Baths
		0 Showers
		2 Geysers
7.3	ELECTRICAL EQUIPMENT	17 Light Switches
		37 Socket Outlets
		43 Light fittings
		13 Isolators
		9 Distribution Boards
		1 Stove
7.4	FENCING AND CLEANING EQUIPMENT	345 m of perimeter fence and gates consisting of 1.8m high diamond mesh.
		5 790 m^2 Site keeping area
		2 Hand dryer units 4 Air fresheners 7 Toilet roll holders 1 She bins 5 Soap dispensers 2 Urinal sanitizers
7.5	ROADS, PARKING AREAS AND STORM WATER	1 362 m^2 of paved areas
		0 m^2 of gravel roads

NO	INSTALLATION	MONANTSA PASS PORT OF ENTRY
7.6	BULK WATER SUPPLY	Water supply from Maluti-a-Phofung Water via water tankers.
		Water is pump from ground level storage tanks to a bulk water storage reservoir
		Clean water is gravitated to various buildings
		Sewage flows to septic tanks
7.7	SEWAGE WORKS	Various septic tanks have been provided on site.
		Sewerage flows to septic tanks
7.8	STANDBY POWER GENERATORS	75 kVA John Deere Faraday standby generator for operational and residential buildings
		Automatic mains failure panel.
7.9	EXTERNAL LIGHTING	4 Security Lights
7.10	HEATING, VENTILATION AND AIR CONDITIONING	1 x 18 000btu split units
		10 x 12 000btu spilt units
7.11	CONVENTIONAL FIRE FIGHTING EQUIPMENT	20 fire extinguishers
		20 fire extinguisher cabinets
		40 signs for fire extinguishers
7.12	PUMPS	1 x Pentax CM 080/1 for pumping water from ground level tanks to high level steel tank

SS 08.01 **EXTEND OF FACILITY ASSETS**

NO	INSTALLATION	PEKA BRIDGE PORT OF ENTRY
8.1	BUILDINGS	5 Houses and 3 residential park homes of 900.36m^2
		5 operational buildings of 718m^2
8.2	SANITARY AND BRASSWARE	122 Taps and valves
		27 WC Pans and Cisterns
		6 Urinals including junior flush masters
		38 Wash hand basins and sink units
		9 Baths
		11 Showers
		12 Geysers
8.3	ELECTRICAL EQUIPMENT	164 Light Switches
		195 Socket Outlets
		175 Light fittings
		33 Isolators
		16 Distribution Boards
		9 Stoves
8.4	FENCING AND CLEANING EQUIPMENT	2 273m of perimeter and residential fence and gates consisting of 1.2m, 1.8 m 3.0m high diamond mesh.
		51 950 m^2 Site keeping area
		8 Hand dryer units 8 Air fresheners 11 Toilet roll holders 4 She bins 7 Soap dispensers 6 Urinal sanitizers
8.5	ROADS, PARKING AREAS AND STORM WATER	2 245 m^2 of paved areas
		0 m^2 of gravel roads

NO	INSTALLATION	PEKA BRIDGE PORT OF ENTRY
8.6	BULK WATER SUPPLY	Water supply from river sump and 2 x boreholes on site.
		Water is pumped from river and boreholes to a water treatment plant and then to two storage reservoir
		Clean water is pumped to various buildings
8.7	SEWAGE WORKS	Various septic tanks have been provided on site.
		Sewerage flows to septic tanks
8.8	STANDBY POWER GENERATORS	130 kVA John Deere Faraday standby generator for operation and residential buildings
		Automatic mains failure panel.
8.9	EXTERNAL LIGHTING	33 Perimeter Lights
		0 High Mast Area Lights
		8 Street Lights
		4 kiosks
8.10	HEATING, VENTILATION AND AIR CONDITIONING	2 x 24 000btu split units
		3 x 18 000bytu split units
		17 x 12 000btu spilt units
8.11	CONVENTIONAL FIRE FIGHTING EQUIPMENT	44 fire extinguishers
		40 fire extinguisher cabinets
		88 signs for fire extinguishers

NO	INSTALLATION	PEKA BRIDGE PORT OF ENTRY
8.12	PUMPS	2 x Submersible borehole pumps
		1 x Submersible raw river water river extraction pump.
		2 x Pentax 160/01 pump at the settling tanks
		1 x Pentax 210/01 pump for the filtration of the treated water

MONANTSA PASS AND PEKA BRIDGE PORTS OF ENTRY: REPAIR, MAINTENANCE AND SERVICING OF BUILDINGS, CIVIL, ELECTRICAL AND MECHANICAL INFRASTRUCTURE AND INSTALLATIONS (36 MONTHS)

PART C4:

SITE INFORMATION

PG-03.1 (EC) SITE INFORMATION – (GCC (2010) 2nd EDITION: 2010)

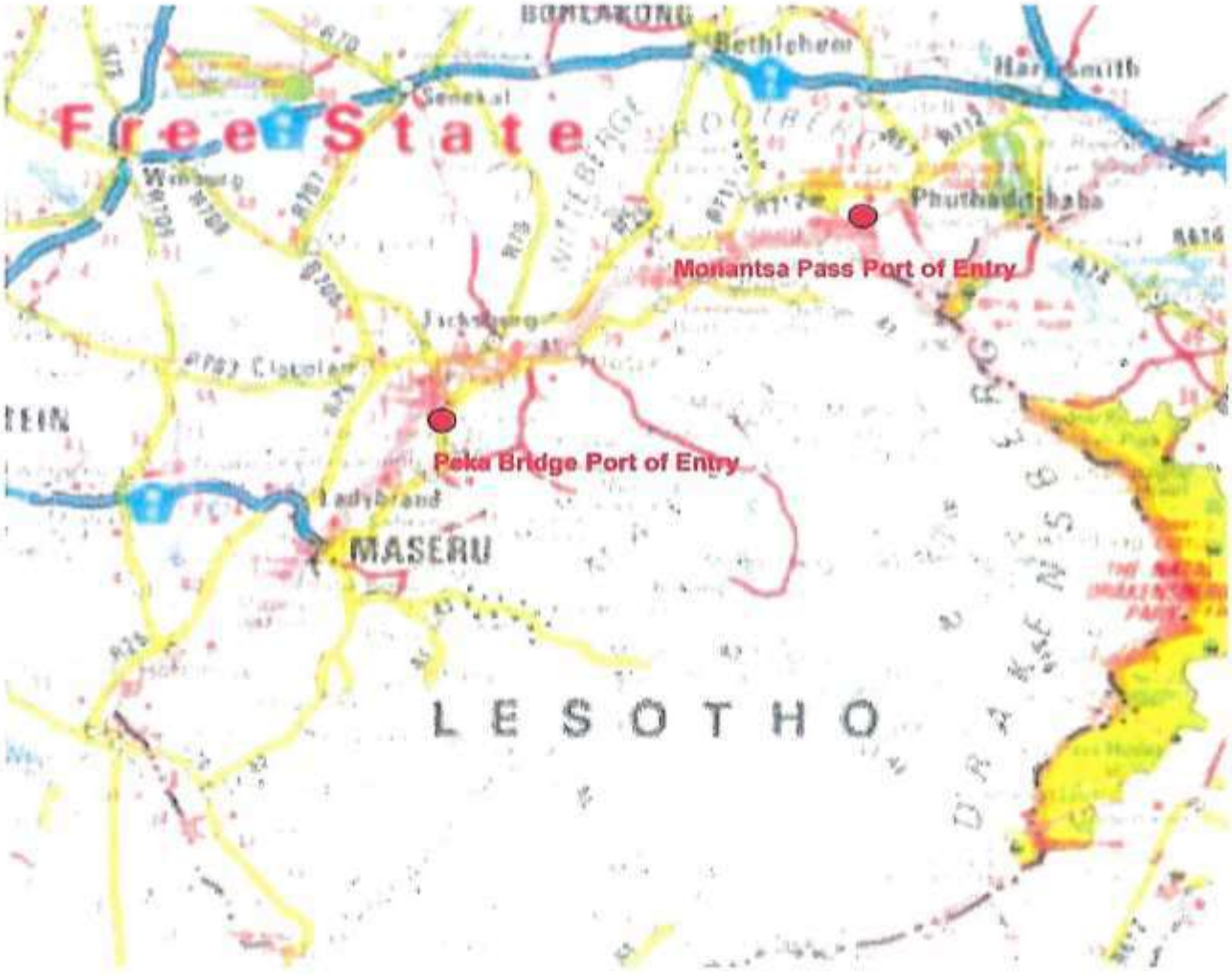
Project title:	Land Ports of Entry: Peka Bridge and Monantsa Pass: Appointment of a Service Provider/s for the Maintenance And Repairs of Buildings, Civil, Mechanical and Electrical Infrastructure and Installation for a Period of 36 Months		
Tender no:	H20/025AI	Reference no:	H20/025AI

C4 Site Information

The construction sites are situated at Monantsa Pass and Peka Bridge Ports of Entry.

- Monantsa Pass Port of Entry is located on the Free State / Lesotho border approximately 42km south of Kestell in the Free State Province (GPS - S 28° 34.92' E 28° 41.93')
- Peka Bridge Port of Entry is located on the Free State / Lesotho border approximately 49km east of Clocolan (GPS - S 28° 56.68' E 27° 44.07')

A Photo report and key plan of Monantsa Pass and Peka Bridge Ports of Entry are contained in this section. The Tenderer should note the portions of the work shall be executed in security areas and that workforce shall be required to wear positive identification at all times. The Ports of Entry are situated along the Lesotho Border as indicated in the map below:



LAND PORTS OF ENTRY: PEKA BRIDGE AND MONANTSA PASS: APPOINTMENT OF A SERVICE PROVIDER/S FOR THE MAINTENANCE AND REPAIRS OF BUILDINGS, CIVIL, MECHANICAL AND ELECTRICAL INFRASTRUCTURE AND INSTALLATION FOR A PERIOD OF 36 MONTHS

LIST OF DRAWINGS

The following drawings shall be issued during the tender period to form part of tender documentation. Where applicable, drawings could be re-issued to the Contractor at commencement of the contract.

DRAWING	DESCRIPTION
001	MONANTSA PASS PORT OF ENTRY: KEY PLAN SHEET 1 OF 1
002	PEKA BRIDGE PORT OF ENTRY: KEY PLAN SHEET 1 OF 1

Any reference to words “Bid” or “Bidder” herein and/or in any other documentation shall be construed to have the same meaning as the words “Tender” or “Tenderer”.

LEGEND OPERATIONS

SITE KEY PLAN

1. ELECT MAIN POWER LINES
2. ELECT MAIN POWER CABLES
3. PERIMETER SECURITY LIGHTS
4. POST TOP LIGHTS
5. WATER PIPE LINE
6. SEWER PIPE LINE
7. SEPTIC TANKS
8. FIRE FIGHTING EQUIPMENT
9. TELKOM LINES
10. STORM WATER
11. AIR CONDITIONER UNITS

BUILDING LIST

1	Control Complex Area 1
2	House No 1
3	Control complex Area 2
4	House No 2
5	V.I.P.S Guard Area
6	House No 3
7	Control complex Area 3
8	House No 4
9	Control complex Area 4
10	House No 5
11	Control complex Area 5
12	Control complex Area 6
13	House No 7
14	Control complex Area 7
15	Cross Border Area
16	Shed
17	Health Screen
18	Clinic (Accommodation Facility)
19	Fire Station
20	Canteen
21	Green Centre
22	Permanent Store
23	PUBLIC WORKS - South Africa
24	Ablution
25	SAPS Office
26	Container
27	Inspection Area - Empty
28	Inspection Bay
29	Admin/Accomodation Building (7 Rooms)
30	SAPS Operational
31	Police Workshop - Customs side
32	20 ft Ablution Facility
33	Ablution Facility 2
34	Ablution Facility 1
35	House No 6
36	Garage for House No 1
37	Workshop
38	House No 8
39	Garage for House No 2
40	5 x 5 Kg Gas Cylinders
41	Canopy
42	Underground Tanks

FIRE FIGHTING EQUIPMENT

NO	TYPE	SIZE	NO	TYPE	SIZE	NO	TYPE	SIZE
FE01	DCP	9 Kg	FE16	DCP	9 Kg	FE32	CO2	4.5Kg
FE02	DCP	9 Kg	FE17	DCP	9 Kg	FE33	CO2	4.5Kg
FE03	DCP	9 Kg	FE18	DCP	9 Kg	FE34	CO2	4.5Kg
FE04	DCP	9 Kg	FE19	DCP	9 Kg	FE35	CO2	4.5Kg
FE05	DCP	9 Kg	FE20	DCP	9 Kg	FE36	CO2	4.5Kg
FE06	DCP	9 Kg	FE21	DCP	9 Kg	FE37	CO2	4.5Kg
FE07	DCP	9 Kg	FE22	DCP	9 Kg	FE38	CO2	4.5Kg
FE08	DCP	9 Kg	FE23	DCP	9 Kg	FE39	CO2	4.5Kg
FE09	DCP	9 Kg	FE24	DCP	9 Kg	FE40	CO2	4.5Kg
FE10	DCP	9 Kg	FE25	DCP	9 Kg	FE41	CO2	4.5Kg
FE11	DCP	9 Kg	FE26	DCP	9 Kg	FE42	CO2	4.5Kg
FE12	DCP	9 Kg	FE27	DCP	9 Kg	FE43	CO2	4.5Kg
FE13	DCP	9 Kg	FE28	DCP	9 Kg	FE44	CO2	4.5Kg
FE14	DCP	9 Kg	FE29	DCP	9 Kg	FE45	CO2	4.5Kg
FE15	DCP	9 Kg	FE30	DCP	9 Kg	FE46	CO2	4.5Kg
FE31	WCP	9 Kg	FE31	DCP	9 Kg	FE47	CO2	4.5Kg

REV	DATE	REVISION DESCRIPTION	DRAWN
00	03-DEC-2020	ISSUED FOR DESIGN	KB

THE MASTER HELD AT THE
OSMAN SOLUTIONS
OFFICE BEARS THE ORIGINAL SIGNATURE OF APPROVAL

public works
Department:
Public Works
REPUBLIC OF SOUTH AFRICA

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CONTRACT NUMBER
WCS050595

CLIENT
PUBLIC WORKS

PROJECT DESCRIPTION
MONANTSA:BCOCC:MAINTENACE AND BRIDGE PORT OF ENTRY
BCOCC:MAINTENANCE AN SERICES OF BUILDINGS, CIVIL, MECHANICAL INFRASTRUCTURE AND INSTALLATIONS

DRAWING TITLE
SITE LAYOUT PLAN
OF
PEKA BRIDGE PORT OF ENTRY

FUNCTION	DESIGN PURPOSE
DESIGNED BY	–
DRAWN BY	K. BUTHELEZI
DESIGN CHECKED BY	–
DRAWING CHECKED BY	K. BUTHELEZI

APPROVAL – LAND SURVEYOR

NAME	K. BUTHELEZI	SIGNATURE	KB
DATE	03-DEC-2020	PROFESSIONAL REG No.	GTg ES0997

DRAWING STATUS CODES:	DATE	03-DEC-2020	
	SCALE 1:1000	SHEET 1 OF 1	SIZE A0

DRAWING NUMBER				REVISION
PROJECT NO.	DIVISION	STATUS	NUMBER	
WCS050595/20 –	SUR	– R	– 001	A