ALEXANDER BAY, VIOOLSDRIFT, ONSEEPKANS PORT OF ENTRY: APPOINTMENT OF SERVICE PROVIDER/S FOR THE MAINTENANCE AND REPAIRS OF BUILDING, CIVIL, MECHANICAL, ELECTRICAL INFRASTRUCTURE AND INSTALLATIONS FOR A PERIOD OF 36 MONTHS **(APPOINTMENT OF A CONTRACTOR)**

PART C3.2:

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATION

A PLUMBING AND DRAINAGE INSTALLATIONS

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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 2014

All regulations and statutory requirements as laid down in the latest edition of the Occupational Health and Safety Act, 1993: Construction Regulations, 2014 as promulgated in Government Gazette No 10113 and Regulation Gazette No 37305 of 7 February 2014 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

B BUILDING STRUCTURAL ELEMENTS

CONTENTS

B 01 SCOPE
B 02 STANDARD SPECIFICATIONS
B 03 GENERAL INCLUSION OF COSTS
B 04 MEASUREMENT AND PAYMENT

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

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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.

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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.

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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).

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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.

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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.

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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.

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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.

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BJ PAINTWORK

BJ.01 <u>Paint to all surfaces</u>:

(a) <u>Description of surface:</u>

(i) Brief description of final paint type:

(a) Description of application area or item to be painted .....Unit: m^2, m, number

(b) Etc, for other areas or items

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 cleaning and preparing existing surfaces, manufacturing, providing and applying each item complete as per specifications, drawings, descriptions as scheduled or as the existing and shall include for all labour, material, preparation work, waste, plant, transport, delivery, access, scaffolding, fuel, miscellaneous items and material, etc to the Engineer's approval.

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TECHNICAL SPECIFICATION

CA ROADS

CONTENTS

CA 01 SCOPE
CA 02 STANDARD SPECIFICATIONS
CA 03 EXECUTION OF MAINTENANCE WORK
CA 04 MEASUREMENT AND PAYMENT

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 ºC, 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 ºC, 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 ºC 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 (m²)
(b) Ripping, redistributing and compacting.....Unit: square metre (m²)
(c) Importing, placing and compacting material from commercial sources ..... Unit: cubic metre (m³)

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 (m²)

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 (m²)

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 (m²)

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
CB 02 STANDARD SPECIFICATIONS
CB 03 EXECUTION OF MAINTENANCE WORK
CB 04 MEASUREMENT AND PAYMENT

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
CC 02 STANDARD SPECIFICATIONS
CC 03 SCOPE OF WORK
CC 04 QUALITY STANDARD
CC 05 MATERIALS
CC 06 MEASUREMENT AND PAYMENT

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, 1993: Construction Regulations, 2014 as promulgated in Government Gazette No 10113 and Regulation Gazette No 37305 of 7 February 2014 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
CE 02 STANDARD SPECIFICATIONS
CE 03 EXECUTION OF MAINTENANCE AND SERVICING
CE 04 MEASUREMENT AND PAYMENT

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, 1993: Construction Regulations, 2014 as promulgated in Government Gazette No 10113 and Regulation Gazette No 37305 of 7 February 2014 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
CF 02 STANDARD SPECIFICATIONS
CF 03 EXECUTION OF MAINTENANCE WORK
CF 04 MEASUREMENT AND PAYMENT

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
CG 02 DETAIL OF MAINTENANCE AND SERVICING WORK
CG 03 MEASUREMENT AND PAYMENT

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
CK 02 STANDARDS AND REQUIREMENTS
CK 03 DETAIL OF WORK
CK 04 MONITORING OF STORAGE TANK ON SITE
CK 05 MEASUREMENT AND PAYMENT

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 on the following points:

(i) Level — *minimum* level 40% of capacity.

(ii) Hygiene — Sample of water must be tested on a monthly basis for the chemical and bacteriological state of the water (SANS 241) – paid for separately, and NOT part of the potable water supplied (delivered) to site by means of carting it to site (refer item CK.01)

(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 including all costs for acquisition, transport, delivery, labour and pumping into existing reservoir. The tendered rate shall also include for testing to ensure no bacteriological contamination has occurred during loading and transporting of the water by testing for the residual chlorine contents of the load to be between 0.5 – 0.05 mg/l. *[Note: This is NOT the monthly test, and the contractor shall not be paid additional for any such testing].* Each and every load delivered to site, shall, before pumped into the storage tank, be tested for residual chlorine content. Should the result indicate a deviation from the 0.5 to 0.05 mg/l envelope, that specific load will be unacceptable. Records must be kept of each and every load's Cl_2 content, with date and time. Should a load contains more than 0.5 mg/l Cl_2, it may be transferred to an acceptable holding tank to mature until it complies, where after it can be pumped into the supply system. Should a load contains less than 0.05 mg/l Cl_2, that load then needs to be chlorinated/disinfected to meet the required envelope; or it shall be rejected and discharged into the storm water system.

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
EA 02 STANDARD SPECIFICATIONS
EA 03 DESCRIPTION OF SERVICING AND TESTING WORK
EA 04 TESTING AND COMMISSIONING
EA 05 MEASUREMENT AND PAYMENT

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

EB WASTEWATER PUMP SYSTEMS

CONTENTS

EB 01 SCOPE
EB 02 STANDARD SPECIFICATIONS
EB 03 PUMP DESIGN AND REQUIREMENTS
EB 04 MOTOR DESIGN AND REQUIREMENTS
EB 05 WORKING VOLTAGE AND SUPPLY SYSTEMS
EB 06 PROTECTION AND CONTROL DEVICES
EB 07 DETAIL OF WORK
EB 08 MEASUREMENT AND PAYMENT

EB 01 SCOPE

This specification covers the decommissioning, removal, servicing, reconditioning, installation, testing, commissioning and maintenance of pumping equipment, motor control devices and low voltage cables.

EB 02 STANDARD SPECIFICATIONS

EB 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 according to the degree of protection that the enclosure provides)
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.

EB 03 PUMP DESIGN AND REQUIREMENTS

(a) Submersible pumps shall be designed to be suitable for submersion in sewage up to a depth of 5 m.

(b) The pump shaft shall be manufactured from stainless steel and shall be sealed with double mechanical face seals where it enters the casing.

(c) The impeller shall be suitable for pumping a type of wastewater as specified in Clause EB 07: Detail of work. All impellers shall be of the non-clogging type. The spacer between the impeller and back plate shall be reset every six months to the minimum distance to prevent clogging of rags between impeller and back plate.

(d) The impeller shall be manufactured from stainless steel or, in the case of other materials, shall be coated with an approved material resistant to abrasion and

corrosion due to the environment specified. For pumps rated below 2 kW, non-metallic impellers may be utilised.

(e) 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.

(f) Only permanently sealed ball or roller bearings shall be installed.

(g) Bearings shall have a B-10 life rating of 100 000 hours.

(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 from the impeller selected shall be at least 1,2 times the maximum head in the pump's operational range.

(k) Each submersible 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 over its full back surface after the completion of corrosion protection on the pump. It may follow the shape of the pump exterior over areas suited for the bending of flat surfaces excluding sharp folds. Under no circumstances shall the label plate influence, damage or otherwise have other detrimental effects 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) All new submersible pumps shall be supplied with a length of power cable to suit the installation shown on the drawings.

(m) All new pumps utilised for the pumping of biological sludges shall be fitted with double flushed mechanical seals, which shall be included in the cost of the pumps. The pump shafts shall be hardened and accurately ground where the seal bears on the shaft. The rotating seal face shall be mounted on a flexible member sealing on the shaft as well. The flexible member shall be manufactured from rubber, PTFE or equivalent material suitable for the operating environment.

(n) 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 %.

EB 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 prevent stocking a variety of special spares.

(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 results 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.

(h) Seal monitors shall be provided for submersible motors, together with the required seal monitor relays. The cost for the seal monitor relays shall be deemed to be included in the rates tendered for the equipment.

EB 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.

EB 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 is switched on, the pump duty shall rotate to 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 restart.

Pumps shall be operated in both manual and automatic modes.

EB 07 DETAIL OF WORK

The Engineer will demarcate any areas to be serviced and shall instruct the Contractor with regard to the servicing and reconditioning work to be done.

Reconditioning or service of pumps shall be carried out where necessary.

EB 07.01 PUMPING EQUIPMENT

The following reconditioning and servicing work shall be done and the detail of work is described in the bill of quantities:

- Decommissioning and removal of pumping equipment.
- Reconditioning of pumping equipment
- Servicing of pumping equipment
- Installation, testing and commissioning of pumping equipment
- Testing, repair and commissioning of level float switches
- Cleaning of pump sumps, removal and disposal of sludge.
- Inspect and repair pump fixtures.

EB 07.02 MOTOR CONTROL CENTRES

(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 board with parts similar and equal to the existing types on the panel.

EB 08 MEASUREMENT AND PAYMENT

EB.01 **DECOMMISSIONING AND REMOVAL 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 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.

EB.02 **SERVICE OF PUMPING EQUIPMENT (PUMPS & MOTORS)** ..... Unit: number

The unit of measurement shall be the number of pumps and motors serviced (full service as per manufacturers specifications).

The tendered rate shall include full compensation for supply of an identification label, resetting the spacer between impeller and back plate and ensuring that impeller rotates freely, as well as cleaning and corrosion .

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

EB.03 **MOTOR CONTROL CENTRES** ..... Unit: number

The unit of measurement shall be the number of motor control centres serviced (full service as per EB 07.02).

The tendered rate shall include full compensation for all labour, materials and service as required.

EB.04 **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.

TECHNICAL SPECIFICATION

EG SEPTIC TANKS

CONTENTS

EG 01 SCOPE
EG 02 MEASUREMENT AND PAYMENT

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

EH MATURATION PONDS

CONTENTS

EH 01 SCOPE
EH 02 STANDARD SPECIFICATIONS AND ADDITIONAL SPECIFICATIONS AND REQUIREMENTS
EH 03 OPERATING AND MAINTENANCE MANUALS
EH 04 DETAIL OF WORK
EH 05 MAINTENANCE
EH 06 MEASUREMENT AND PAYMENT

EH 01 SCOPE

This specification covers the requirements for maintenance and servicing responsibilities for maturation ponds.

The function of maturation ponds as part of a wastewater works is polishing of secondary sedimentation tank effluent as part of the whole process of chemical oxygen demand reduction.

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.

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.

EH 02 STANDARD SPECIFICATIONS AND ADDITIONAL SPECIFICATIONS AND REQUIREMENTS

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:

EH 02.01 GENERAL STANDARD SPECIFICATION

Ponds are usually earth dams with concrete linings, to which the following specification shall apply:

SANS 1200 Standardized Specification for civil engineering construction.

EH 02.02 ADDITIONAL REQUIREMENTS

Ponds shall have positive overflow weirs. The overflow structure of all ponds shall be such that water is free to fall into the next pond's inflow structure. Where outflows between ponds are submerged, aquatic growths are not allowed to exit the system naturally and tend to accumulate.

EH 02.03 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: Construction Regulations, 2014 as promulgated in Government Gazette No 10113 and Regulation Gazette No 37305 of 7 February 2014 shall be adhered to.

EH 02.04 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.

EH 02.05 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.

EH 03 OPERATING AND MAINTENANCE MANUALS

The Contractor shall at the start of the Contract be given all available 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.

This shall be done in accordance with Additional Specification SB: Operating and Maintenance Manuals.

EH 04 DETAIL OF REPAIR WORK

EH 04.01 GENERAL

The Contractor shall investigate and inspect all areas of the installation to confirm the extent of the repair work required and shall report to the Engineer. The Engineer will thereafter demarcate any areas to be repaired and shall instruct the Contractor with regard to the repair work to be done.

EH 04.02 ACCOMMODATION OF EXISTING FLOW

Incoming existing flow shall be accommodated by means of temporary submersible pumps or mobile self-priming pumps and pipework. The Contractor shall supply temporary pumping equipment to discharge to various positions on site, as specified below.

EH 04.03 MATURATION PONDS

The maturation ponds shall be emptied completely while existing flow is accommodated at the same time, either by pumping incoming flow into the pump sump of the other maturation pond, or by pumping into the maturation pond directly. No water shall be let out through the emergency overflow line as part of this action.

After emptying each maturation pond, it shall be left to allow sediment to dry completely, after which all residue and organic mass that may have settled to the bottom will be removed and buried with dried sludge.

EH 05 MAINTENANCE

Maintenance of maturation ponds shall include all work necessary to maintain water quality with regard to aquatic growths. Aquatic growths shall be removed manually and disposed of with dried sludge.

Maturation pond outlet structures, weirs and emergency outlets, as well as all pipework and channels interconnecting ponds and other units (such as sedimentation tank inlet pipes or effluent recycle outlet channels) shall be maintained clean, neat and in a perfect functional condition.

The regular cleaning of the surface of the ponds and removal of artificial solids shall form part of the maintenance work.

Remuneration for the maintenance of maturation ponds shall be included in the tendered rate for ten points for maintenance of the installation of which maturation ponds form part.

Installations shall be as defined in Additional Specification SA: General Maintenance, and on the mechanical flow diagram.

EH 06 MEASUREMENT AND PAYMENT

EH.01 **EMPTY MATURATION PONDS AND REMOVE SLUDGE** ..... Unit: cubic metre (m^3)

The unit of measurement shall be the cubic metre determined by the surface area of the pond times the average depth of excavation.

The tendered rate shall include full compensation for the excavation and for removal to and dumping the excavated material at a solid waste disposal site.

TECHNICAL SPECIFICATION

EJ WASTEWATER AND POTABLE WATER QUALITY MEASUREMENT AND TESTING

CONTENTS

EJ 01 SCOPE
EJ 02 STANDARD SPECIFICATIONS
EJ 03 TEST METHODS
EJ 04 DETAIL OF WORK
EJ 05 TESTING BY AUTHORITIES
EJ 06 MEASUREMENT AND PAYMENT

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
EN 02 LICENSING OF A WATER USE (BOTH DRINKING WATER AND WASTEWATER)
EN 03 REGISTRATION OF A WATER WORKS (BOTH DRINKING WATER AND WASTEWATER)
EN 04 COMPULSORY NATIONAL STANDARDS AND MEASURES TO CONSERVE WATER (REGULATION R.509 OF 8 JUNE 2001) (DRINKING WATER ONLY)
EN 05 POLLUTION PREVENTION (WASTEWATER AND DRINKING WATER)
EN 06 MEASUREMENT AND PAYMENT

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 AIR-CONDITIONING SYSTEMS

CONTENTS

FD 01 SCOPE
FD 02 STANDARD SPECIFICATIONS
FD 03 DETAIL OF MAINTENANCE WORK
FD 04 MEASUREMENT AND PAYMENT

FD 01 SCOPE

This specification encompasses all aspects regarding the particulars of the maintenance and servicing work to the Heating Ventilation and Air-conditioning systems at the Ports of Entry.

The Ports of Entry consists of various air-conditioning equipment, as listed in specification **SS: Site Specific Inventory**, which form part of the maintenance and servicing contract for heating, ventilation and air-conditioning.

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 10400	-	The applications of the National Building Regulations
SANS 10142	-	Code of practice for the wiring of premises
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

PW 371	-	Specification of materials and methods to be used
STD.PWD.VIII	-	Standard specification for refrigeration services
STS 1	-	Standard specification for air conditioning services
STS 5	-	Standard specification for electrical installations and equipment pertaining to mechanical installations

FD 03 DETAIL OF MAINTENANCE WORK

FD 03.01 GENERAL SERVICING 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 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.

(c) 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.

FD 03.02 TESTING OF REFRIGERATION PIPING AND EQUIPMENT

(a) 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.

(b) 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.

(c) 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 maintained until such time that a leak occurs or the system has to be decanted. The system shall then be converted to a compatible HCFC or HFC 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.

(d) 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.

(e) 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 03.04 NOISE AND VIBRATION

(a) Equipment shall be mounted on vibration isolators of the correct type and selection depending on deflection requirement and vibrating frequency.

FD 03.05 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 03.06 SERVICING OF SELF-CONTAINED AIR-CONDITIONING UNITS

- Clean air intake screen.
- Replace filters.
- De-rust, neutralize and touch up paintwork.
- Replace canvas collars.
- Clean housing, ensure all panels are properly secured and door panels close properly.
- Check setting and operation of all pressure switches, reset if required.
- Check setting and operation of all safety switches, ie LP and HP switches, oil pressure switch.
- Check setting and operation of thermostats.
- Check timers and reset if required.
- Check operation of seven-day timer.
- Check running current of fans and compressor and settings and operation of overloads.
- Check tightness of all electrical terminals.
- Ensure operation of local and remote isolators.
- Check condition of all cables and whether cables are neatly strapped and reposition and strap if required.

- Ensure correct operation of emergency stop.
- Carry out a leak test on all refrigeration piping and components inclusive of evaporator and condenser.
- 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.
- The superheat setting of the thermostatic expansion valve shall be checked and adjusted if required (setting approximately 8 °C).
- The filter dryer shall be replaced.
- Check compressor vibration mounts.
- Test oil acidity.
- Check refrigerant charge sight glass being clear or flashing.
- Check moisture indication being dry.
- Clean condensate tray and test drainage operation.
- Clean evaporator and condenser blades and check unbalance.
- Replace suction line insulation.
- Check all service valves for full operation, replace caps if missing.

FD 04 MEASUREMENT AND PAYMENT

FD.01 **Service Air-Conditioning unit**……..Unit: Number (No)

The unit of measurement shall be the number of Air-Conditioning units completely serviced in accordance with FD 03.06.

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.

FD.02 **Replace AC temperature controller (remote)**……..Unit: Number (No)

The unit of measurement shall be the number of missing controllers replaced.

The tendered rate shall include full compensation for the supply and installation of the new controller as well as testing (including batteries).

FD.03 **Replace AC remote batteries (per controller)**……..Unit: Number (No)

The unit of measurement shall be the number of Air-conditioning remote controllers of which the full set of batteries have been replaced.

The tendered rate shall include full compensation for the supply and installation of the new batteries.

FD.04 **Supply Temperature Data Logger**……..Unit: Number (No)

The unit of measurement shall be the number of electronic temperature data loggers supplied to site for effective monitoring of temperatures (internal). The data logger is a portable electronic device that records data over time with a built in temperature sensor and enabling data transfer to a computer via USB cable. The units shall be small, battery powered, portable, and equipped with a microprocessor, internal memory for data storage, and sensors. Furthermore it shall interface with a personal computer and utilize software to view and analyze the collected data for a period of 7 days.

TECHNICAL SPECIFICATION

FN WATER PUMP SYSTEMS

CONTENTS

FN 01 SCOPE
FN 02 STANDARD SPECIFICATIONS
FN 03 PUMP DESIGN AND REQUIREMENTS
FN 04 MOTOR DESIGN AND REQUIREMENTS
FN 05 WORKING VOLTAGE AND SUPPLY SYSTEMS
FN 06 PROTECTION AND CONTROL DEVICES
FN 07 DETAIL OF WORK
FN 08 MEASUREMENT AND PAYMENT

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

HB STANDBY POWER SYSTEMS

CONTENTS

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HB 02 STANDARD SPECIFICATIONS, REGULATIONS AND CODES
HB 03 MAINTENANCE TOOLS AND SPARES
HB 04 STANDBY GENERATORS: TECHNICAL DETAILS
HB 05 MEASUREMENT AND PAYMENT

HB 01 SCOPE

This specification comprises all aspects regarding the maintenance and servicing of standby power systems.

The Ports of Entry comprise of various Standby Power Systems, as listed in additional specification **SS: Site Specific Inventory**, which forms part of the maintenance and servicing contract for standby power systems.

HB 02 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

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

HB 02.01 SANS Specifications

SANS 10400 : THE APPLICATION OF THE NATIONAL BUILDING REGULATIONS
SANS 10142-1: THE WIRING OF PREMISES PART 1: LOW-VOLTAGE INSTALLATIONS

HB 03 MAINTENANCE TOOLS AND SPARES

On commencement of the Maintenance and Servicing Contract, the Contractor shall supply and deliver certain tools and spares to the Generator Room. 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.

The Tools and Spares (SET) shall comprise of:

- 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
- 10mm² battery jumper cables: 1 pair

HB 04 STANDBY GENERATORS: TECHNICAL DETAILS

The Ports of Entry comprise of various Standby Power Systems, as listed in additional specification **SS: Site Specific Inventory**, which forms part of the contract for standby power systems

HB 04.01 Scope of Maintenance and Servicing work : Generators

- Clean plant room, clean and re-lamp luminaires. Place rodent poison inside cable trenches (2 x 500g).
- Thoroughly clean floor
- Service diesel engine and steam clean engine, alternator as well as day tank.
- Inspect all rubber hoses and wiring.
- Service existing battery.
- Do cold starting volt drop test on prime mover starter battery.
- 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.
- Service lagging on exhaust system and reseal room exit port.
- Fit new padlocks on plant room.
- Do witnessed dummy load test.
- Service change-over switchgear. Disassemble contactors and clean. Test operation following service.

HB 05 MEASUREMENT AND PAYMENT

HB.01 **Clean Generator plant room**……Unit: Number (no)

The unit of measurement shall be the **number** of generator rooms cleaned.

The tendered rate shall include full compensation for the cleaning of the plant room and degreasing of floor. This includes fitting of new padlocks.

Walls and ceilings shall be washed with sugar soap. Floors shall be washed (Steam cleaned and degreased). Cable trenches shall be cleaned and finally vacuumed.

HB.02 **Service genset**……..……Unit: Number (no)

The unit of measurement shall be the **number** of Gensets (Diesel Engine AND electrical components) serviced.

The tendered rate shall include full compensation for the complete mechanical and 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 04.01.

HB.03 **Diesel engine service**……..……Unit: Number (no)

The unit of measurement shall be the **number** of mechanical services performed on diesel engines in the 75kW 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 04.01.

HB.04 **Dummy load test**……..……Unit: Number (no)

The unit of measurement shall be the **number** of on-site dummy load tests performed (and witnessed by the Engineer or his representative).

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.05 **Service Change-over switchgear**……..……Unit: Number (no)

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

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

Service alarm, 12/24V DC Emergency Light 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.06 **Supply of diesel fuel**……..……Unit: Litres (*l*)

The unit of measurement shall be the **quantity (litres)** of diesel fuel supplied, delivered to site and transferred into bulk storage tanks when required or upon instruction from the Engineer.

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

HB.07 **Supply of Tools and Spares**……..……Unit: Set

The unit of measurement shall be the **number** of **SETS of tools** supplied. The tendered rate shall include full compensation for the supply and delivery of the Tools and Spares specified in HB 03 above.

HB.08 **Supply of First Aid Kit**……..……Unit: Number (no)

The unit of measurement shall be the **number** of First Aid Kits supplied and delivered to site (FAK02A).

PARTICULAR SPECIFICATION

PHB SUPPLY DELIVERY AND INSTALLATION OF AN EMERGENCY GENERATOR SET

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.

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.

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

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.

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

1. GENERAL

Supply, deliver, install, commission, and test an emergency generating set at the specified Port of Entry.

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 shall be installed in an existing plant room.

SPECIFICATION FOR THE SUPPLY DELIVERY AND INSTALLATION OF AN EMERGENCY GENERATOR SET

SECTION 4 – PARTICULAR SPECIFICATION

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.

1.4 The new diesel generator and associated day tank shall be installed in the same position as the previous unit.

1.5 A Generator change-over panel with change-over equipment is required.

2. SITE MEASUREMENTS

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 where applicable.

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 Engineer 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 350 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 400 litre capacity shall be manufactured, supplied and installed and shall form part of the base of the Generator.

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 60º 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 Engineer 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 Engineer 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 Engineer 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 Engineer, 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 Engineer for approval *before* commissioning takes place. Note that the Engineer will not commission the system or any part thereof on behalf of the contractor. The contractor, to the satisfaction of the Engineer shall perform all commissioning. The Engineer will witness commissioning.

24. MAINTENANCE AND OPERATING MANUALS

The contractor shall prepare and provide comprehensive maintenance and operating manuals 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 Engineer 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 Engineer in writing. After completion of the training period, the Engineer 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 client.

TECHNICAL SPECIFICATION

HC LOW VOLTAGE RETICULATION

CONTENTS

HC 01	SCOPE
HC 02	STANDARD SPECIFICATIONS, REGULATIONS AND CODES
HC 03	DISTRIBUTION KIOSKS
HC 04	OVERHEAD DISTRIBUTION SYSTEM
HC 05	MEASUREMENT AND PAYMENT

HC 01 SCOPE

This specification comprises all aspects regarding the maintenance and servicing of low voltage systems. Low voltage comprises:

- low voltage distribution boards
- low voltage kiosks
- low voltage overhead distribution system

HC 02 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

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

HC 02.01 SANS Specifications

- SANS 10142-1
- SANS 10142-2
- SANS 141
- SANS 1091
- SANS 1195
- SANS 784
- SANS 763

HC 02.02 Department of Public Works Specifications

- PW 774

HC 03 DISTRIBUTION AND METERING KIOSKS

This section describes the electrical distribution and metering kiosks that will be serviced 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 03.01 **Scope of servicing 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 04 OVERHEAD DISTRIBUTION SYSTEM

This section describes the low voltage overhead distribution system that will be serviced 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 04.01 **Scope of servicing work**

(a) Visual inspection and servicing 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.

HC 05 MEASUREMENT AND PAYMENT

HC.01 **Service distribution kiosk**……..Unit: Number (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, remove rust and paint kiosk, label kiosk, supply new padlock, earth testing, securing of MCB and terminations).

HC.02 **Service overhead distribution system**……..Unit: Meter (m)

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

The tendered rate shall include full compensation for inspection and servicing / securing / tightening of conductors and insulators, clearing of vegetation, securing of connections and terminations.

HC.03 **Installation of domestic electricity meter**……. Unit: Number (No)

The unit of measurement shall be number of domestic electricity meters installed.

The tendered rate shall include full compensation for supply, delivery, installation and testing of the approved domestic electricity meters.

TECHNICAL SPECIFICATION

HE EXTERNAL LIGHTING SYSTEMS

CONTENTS

HE 01 SCOPE
HE 02 STANDARD SPECIFICATIONS, REGULATIONS AND CODES
HE 03 MEASUREMENT AND PAYMENT

HE 01 SCOPE

This specification comprises all aspects regarding the maintenance and servicing of external lighting systems. External lighting comprises:

i) Area lighting
ii) Security lighting along perimeter fences
iii) Street lighting

HE 02 STANDARD SPECIFICATIONS, REGULATIONS AND CODES

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

HE 02.01 SANS Specifications

SANS 10400	The application of the National Building Regulations
SANS 10142-1	The wiring of premises Part 1: Low-voltage installations
SANS 10225	The design and construction of lighting masts
SANS 1277	Street lighting luminaires
SANS 1088	Luminaire entries and Spigots
SANS 1749	Glass-reinforced polyester (GRP) poles
SANS 1250	Capacitors for use with fluorescent and other discharge lamp ballasts
SANS 1279	Floodlight luminaires
SANS 1777	Photoelectric control units for lighting (PECUs)
SANS 121	Hot dip galvanised coatings on fabricated iron and steel articles – Specifications and test methods
SANS 1266	Ballasts for discharge lamps (excluding tubular fluorescent lamps
ARP 035	Street lighting maintenance

HE 02.02 Department of Public Works Specification PW 774

HE 03 MEASUREMENT AND PAYMENT

HE.01 **Re-lamp luminaire**……Unit: Number (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.

HE.02 **Service luminaire**……Unit: Number (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, turning the luminaire to the correct angle and the checking of earthing continuity, connections and aiming angle.

HE.03 **Service light pole**……Unit: Number (No)

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

The tendered rate shall include full compensation for the opening of pole cover/junction box, visual inspections, tightening all connections, tightening luminaire bracket, cable straps, straightening of the pole as well as treating with creosote in the case of a wooden pole.

TECHNICAL SPECIFICATION

JC FIRE FIGHTING EQUIPMENT

CONTENTS

JC 01 SCOPE
JC 02 STANDARD SPECIFICATIONS
JC 03 MAINTENANCE AND SERVICE DETAILS
JC 04 MEASUREMENT AND PAYMENT

JC 01 SCOPE

This specification covers the general maintenance and servicing of the fire fighting equipment installations, which include the following:

(a) Fire hydrants
(b) Fire hose reels
(c) Fire extinguishers

The Ports of Entry consists of various facilities, as listed in additional specification **SS: Site Specific Inventory**, which forms part of this contract for fire fighting equipment.

JC 02 STANDARD SPECIFICATIONS

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 SANS and other specifications and codes

SANS 6172; ICS 13.220.10	-	Fire extinguishers- Assessment of fire rating
SANS 10105-1; ICS 13.220.10	-	The classification, use and control of fire-fighting equipment Part 1: Portable fire extinguishers
SANS 1567; ICS 13.220.10	-	Fire extinguishers, portable, rechargeable, carbon dioxide
SANS 1573; ICS 13.220.10	-	Portable rechargeable fire extinguishers – CO_2 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 543; ICS 13.220.10	-	Fire hose reels (with hose)
SANS 10105-2; ICS 13.220.10	-	Fire hose reels
SANS 1128-2; ICS 13.220.10, 23.040.60	-	Hose couplings, connectors and branch pipe and nozzle connections
SANS 1128-1; ICS 13.220.10, 23.060.99	-	Components of underground and above-ground hydrant system
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 543; ICS 13.220.10	-	Fire hose reels (with hose)
SANS 10105-2; ICS 13.220.10	-	Fire hose reels
SANS 1128-2; ICS 13.220.10, 23.040.60	-	Hose couplings, connectors an branch pipe and nozzle connections
SANS 1128-1; ICS 13.220.10, 23.060.99	-	Components of underground and above-ground hydrant systems

JC 02.02 Department of Public Works Specifications

F.P.O/G.61/3E	-	Fire Security: A guide to Architects
PW 371	-	Specification of Materials and Methods to be used (Fourth revision, October 1993)

JC 03 MAINTENANCE AND SERVICE DETAILS

All maintenance work shall be executed using approved materials and equipment suitable to the systems and/or installations they serve. 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 applicable specifications included in this document.

Maintenance and servicing items for the fire fighting equipment shall be categorised under the following headings:

(a) Fire hydrants
(b) Fire hose reels
(c) Fire extinguishers

JC 03.01 FIRE HYDRANTS

Servicing and maintenance to the fire hydrants system shall include but not be limited to the following:

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

(b) Replacement of main hydrant seals;

(c) Repair/replacement of quick coupling catches;

(d) Replacement of damaged shaft ends (right hand wheel type);

(e) Replacement of damaged and expired or missing 65 mm diameter hose streamers;

(f) Replacement of damaged or missing 65 mm diameter hose nozzle;

(g) Replacement of damaged valve stem seals;

(h) Replacement of fire cupboard doors and locks;

(i) Replacement, Repair and repainting of concrete pedestals;

(j) Replacement of fire damaged, missing or shortfall fire signage to equipment;

(k) Hydrants shall be labelled with identifying tags and details recorded.

JC 03.02 FIRE HOSE REELS

Maintenance and servicing to the fire hose reel systems shall include but no be limited to the following:

(a) Replacement of the hose drum seal where leaks occur;

(b) Replacement of the 30 m hose where perished, damaged or missing;

(c) Repair damaged hose drums and, where directed by the Engineer, replace with new;

(d) Replace gland packing and gaskets to hose reel shut-off valve;

(e) Replace missing hose reel shut-off valve wheel handles;

(f) Number and catalogue hose reel;

(g) Where hose reels shut-off valves are damaged beyond repair, these shall be replaced with new;

(h) All hose reel mountings shall be checked and where loose or damaged, replaced with new;

(i) Where paintwork of equipment has deteriorated, such equipment items shall be replaced and repainted in accordance with the manufacturer's specification;

(j) Hose reels shall be labelled with identifying tags and details recorded, including service record.

JC 03.03 FIRE EXTINGUISHERS

Maintenance and servicing to the fire extinguishers shall include, but not be limited to the following:

(a) Dry chemical powder extinguishers shall be 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.

(b) CO_2 extinguishers shall be 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.

JC 04 MEASUREMENT AND PAYMENT

JC.01 **SUPPLY AND INSTALLATION OF FIRE EXTINGUISHERS**.....Unit: number

The tendered rate shall include full compensation for the supply, delivery, positioning, installation and hand-over of the fire extinguishers, including all necessary brackets, backboards, etc.

The tendered rates shall also include full compensation for the supply, delivery, positioning and fixing of all fire signage as required by regulation. The tendered rate shall also include full compensation for the labelling with identifying tags and recording of details of all equipment.

JC.02 **SERVICING AND CLEANING OF FIRE HYDRANTS**…….Unit: number

The tendered rate shall include full compensation for the servicing or replacement of damaged, broken, leaking or corroded pipework and fittings, main hydrant seals, quick coupling catches, shaft ends for right-angle hand wheel type hydrants, streamers, hose nozzles, valve steam seals, fire cupboard doors and locks, damaged, missing or shortfall fire signage, etc.

The tendered rate shall also include full compensation for the labelling with identifying tags and recording of details of all equipment.

JC.03 **SERVICING AND CLEANING FIRE OF HOSE REELS**……. Unit: number

The tendered rate shall include full compensation for the servicing or replacement of damaged hose drums, mountings and shut-off valves, replacement of damaged or missing 30 m hoses, hose nozzles, shut-off valve wheel handles, hose drum seals where leaks occur, gland packing and gaskets of shut-off values, repainting of deteriorated paintwork, replacement of fire cupboard doors and locks, damaged, missing or shortfall fire signage, etc.

The tendered rate shall also include full compensation for the labelling with identifying tags and recording of details of all equipment.

JC.04 **SERVICING, CLEANING AND RECHARGING OF FIRE EXTINGUISHERS**.....Unit: number

The tendered rate shall include full compensation for the servicing or replacement of all damaged, faulty or missing discharge hoses and nozzles, pressure gauges, operating instructions, the recharging of discharge cylinder to required capacity for DCP, and the recharging of CO_2 extinguisher to capacity, servicing, resealing of CO_2 discharge mechanism, checking, servicing and repairing of activation mechanisms, replacement of DCP content of extinguishers, the replacement of fire cupboard and cabinet doors and locks, damaged, missing or shortfall fire signage, brackets and backboards, etc.

The tendered rate shall also include full compensation for the labelling with identifying tags and recording of details of all equipment.

JC.05 **COMPILATION OF FIRE PLAN FOR EACH OF THE SERVICE BUILDINGS**.....Unit: site

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

The unit of measurement shall be for each site (all service buildings) for which the fire plans were developed, printed and laminated. The tendered rate shall include full compensation for all drawings, printing, duplicating and laminating.

JC.06 **FIRE FIGHTING TRAINING**.....Unit: number

The end user shall be trained, by the supplier of the fire fighting equipment, to operate the individual fire fighting equipment. Fire fighting training shall be done by a national accredited training institute (Fire Protection Association of South Africa).

The unit of measurement shall be the number of training sessions conducted for a maximum of 20 attendees including all training material, transport and training-aids required.

TECHNICAL SPECIFICATION

L ELECTRICAL INSTALLATIONS

CONTENTS

L 01 SCOPE
L 02 STANDARD SPECIFICATIONS, REGULATIONS, CODES AND ADDITIONAL SPECIFICATIONS
L 03 ELECTRICAL INSTALLATION TECHNICAL DETAILS
L 04 MEASUREMENT AND PAYMENT

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
L	FLUORESCENT - C/LT RECESSED 1200X600 3X36W T8 LBR – KR22ES
M	FLUORESCENT - C/LT SURFACE 1200X600 3X36W T8 – KR28ES
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 unit of measurement in number shall include full compensation for the testing of the earth installation by a specialist contractor approved by the Engineer per building.

L.20 **Provide certificate of compliance**…….No

The unit of measurement in number shall include full compensation for the provision of COC's by a specialist contractor approved by the Engineer per building.

ALEXANDER BAY, VIOOLSDRIFT, ONSEEPKANS PORT OF ENTRY: APPOINTMENT OF SERVICE PROVIDER/S FOR THE MAINTENANCE AND REPAIRS OF BUILDING, CIVIL, MECHANICAL, ELECTRICAL INFRASTRUCTURE AND INSTALLATIONS FOR A PERIOD OF 36 MONTHS

PART C3.3:

ADDITIONAL SPECIFICATIONS

ADDITIONAL SPECIFICATION

SA MAINTENANCE AND SERVICING

CONTENTS

SA 01 SCOPE
SA 02 MAINTENANCE APPROACH
SA 03 MAINTENANCE REQUIREMENTS
SA 04 MAINTENANCE CONTROL
SA 05 COMMUNICATION
SA 06 PERFORMANCE MEASUREMENT
SA 07 PREVENTATIVE MAINTENANCE ACTIONS
SA 08 MANDATORY PERIODICAL SERVICES
SA 09 OPERATION OF INSTALLATIONS
SA 10 MEASUREMENT AND PAYMENT

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**
VIOOLSDRIFT PORT OF ENTRY	5 days a week	6 hours
ALEXANDER BAY PORT OF ENTRY	3 days a week	5 hours
ONSEEPKANS PORT OF ENTRY	3 days a week	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, Solar Geysers and Building Electrical), Roads, Stormwater, Water distribution, Sewer Networks, Standby Power Generation, External Lighting, Water Purification Works (sand filters, automation of works, dosing, etc.), Wastewater Treatment Works, HVAC Installations and Fire fighting equipment at the following Port of Entry:

- **Vioolsdrift Port of Entry**
- **Alexander Bay Port of Entry**
- **Onseepkans 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 and servicing are performed as described in the operating and maintenance manuals (where applicable) and 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	R150/hour
Ordinary Breakdown	4 Days	R200/day
Malicious damage	7 Days	R200/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, Refuse Removal and Pest Control

- SA 07.03 – Fencing
- SA 07.04 – Refuse 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 – Water Works
- SA 07.11 – Sewerage Networks and Works
- SA 07.12 – Wastewater Pump Systems

6. Roads and Stormwater Drainage

- SA 07.13 – Roads
- SA 07.14 – Stormwater Drainage

7. External Lighting and Standby Power

- SA 07.15 – External Lighting
- SA 07.16 – Low Voltage Distribution Network
- SA 07.17 – Standby Power Systems

8. Heating, Ventilation and Air-Conditioning Systems

- SA 07.18 – Heating, Ventilation and Air-Conditioning Systems

9. Fire Fighting Equipment

- SA 07.19 – Fire Fighting Equipment

10. Water and Wastewater Works

- SA 07.11.01 – Sewerage Works
- SA 07.10 – Water Works
- Operation and Maintenance Manuals

11. Telemetry

- SA 07.20 – Telemetry System

12. Solar Geyser

- Operation and Maintenance Manuals

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

SOLAR GEYSERS

NO	PREVENTATIVE MAINTENANCE ITEM DESCRIPTION	MAINTENANCE FREQUENCY
1	Annually prune or cut trees and shrubs that shade the system	Annually
2	In extremely dusty areas subject to dust or sand storms, the glass of the collector should be washed with clean water	Monthly
3	Turn off back-up elements when using hot water for maximum savings.	Daily

4	Only have elements on, overnight or in the morning, if your hot water usage during the morning is likely to be reasonably heavy. If this is a regular pattern, consider installing a timer.	Daily
5	If there is a heavy demand for hot water in the evening as well as morning; it is imperative that the element is switched on at night and switched off in the morning.	Daily
6	Wash the glass cover of the collector with a household detergent.	Four-monthly
7	Inspect the collector mounting	Monthly
8	Inspect the pressure/temperature relief valve on the cylinder. The valve release cap should be opened several times to verify operation	Monthly
9	Check that the relief valve drain lines are clear	Monthly
10	Specialist carries out a service every year	Annually
11	REPLACEMENT OF THE GLASS ON SOLAR COLLECTORS IS HAZARDOUS AND SHOULD BE DONE BY CERTIFIED SOLAR HEAT SPECIALISTS	As required
12	Visually inspect hot water system for any obvious defects, i.e. broken glass, excessive dust build-up, shading, leaks etc.	Monthly
13	Drain and replace 'Collector Protector' heat transfer fluid.	Yearly
14	Replace cylinder and collector washers.	As required
15	Replace 4-bar temperature/pressure relief valve.	Annually
16	Where fitted, check electric element for excessive calcium build up or corrosion. Replace if necessary.	Monthly
17	Replace anodes. Generally, where the water is supplied from a borehole or well, the quality of the water will be such that a three-year or less anode change will be required. A water analysis is recommended for these locations.	Monthly
18	Check that all drain lines are clear and free to operate.	Monthly
19	Inspect pipe flashing.	Monthly
20	Check element for correct operation.	Monthly
21	Clean glass and report any additional repairs required.	Monthly
22	Where the calcium and/or hardness of the water quality is high, it may be necessary to drain and flush the storage cylinder to get rid of any build up of sediment on the bottom of the cylinder.	Monthly
23	Shading from trees is not excessive and is not covering the collector for all or part of the day.	Monthly
24	Hot water usage is not excessive or the demand has increased.	Monthly
25	Hot water is not leaking from within the plumbing system.	Monthly
26	Element circuit breakers are turned ON.	Monthly
27	Timer (if fitted) is set correctly.	Monthly
28	At the start of a clear day, close the cold water inlet valve to the water heater.	Monthly
29	Switch off the electric element.	Monthly
30	At the end of the day, with no hot water draw-off, open the cold water inlet valve.	Monthly
31	Open hot water tap until water runs hot.	Monthly

32	If the water is not hot, refer to manual.	Monthly
33	If it is hot, your system is functional.	Monthly

MAINTENANCE LOG FOR GEYSERS

MODEL NO: ……. OWNER: …….

DATE OF INSTALL: …… INSTALLER: …….

Servicing Details

DATE OF SERVICE: ……..……. BY:…….

COMMENTS: ……..……..

……

SPECIALIST'S SIGNATURE: …….

DATE OF SERVICE: ……..…. BY: ……..…….

COMMENTS: ……..

…….……

SPECIALIST'S SIGNATURE: …….

DATE OF SERVICE: ……..…..…... BY: ……..……

COMMENTS: ……..……..

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SPECIALIST'S SIGNATURE: ……

DATE OF SERVICE: …….. BY: …….

COMMENTS: ……..

SPECIALIST'S SIGNATURE: …….

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 REFUSE REMOVAL AND PEST CONTROL

The whole of the site within the perimeter fences of the Port 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 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 sanitary condition	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 release valves and vacuum breakers	Four-monthly
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

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

SA 07.10 WATER WORKS

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

As part of the operation and maintenance of the Vioolsdrift Port of Entry water works, operators and maintenance personnel are also responsible for the following general maintenance duties:

- The maintenance forms and records must be completed.
- The system supervisor is responsible for all maintenance documentation.
- Any case of malfunction where looseness, leakage, damage or any other irregular condition of the equipment shall be brought to the attention of the maintenance personnel , to be corrected.
- Be constantly alert for any unusual sound or action of the equipment.
- Report any deviation from normal operation without delay.
- Keep the equipment as clean as possible at all times.
- Remove rust and clean, prime and retouch with paint as often as necessary.
- Check for loose or damage bolts, nuts, screws, etc. Tighten or replace as necessary.
- Check for leaks. Rectify any leaks as necessary.

- All reporting and readings should be in the format of the logbook sheets supplied at the end of this section.

SA 07.10.01 Routine Inspections and Maintenance

All system operators are responsible for the following inspection procedures before using the equipment. All deviations from the specifications, defective equipment or malfunctions must be reported immediately to the maintenance personnel.

- Check for signs of leaks or cracks
- Check that all equipment is in a serviceable condition.

SA 07.10.02 Maintenance Actions – Daily

- 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 the control panel for any alarm
- Make up chemicals if required
- Check pressure gauges for normal reading
- Check pH & chlorine readings and record
- Press the manual cycle button on the panel to check the high lift pump

SA 07.10.03 Maintenance Actions – Weekly

- Do all daily checks
- Clean out the strainer in the chlorine feed line
- Clean out plant room
- Check chemical stock – reorder if needed
- Check the pump rotation schedule and action accordingly

SA 07.10.04 Maintenance Actions – Monthly

- Do all daily checks
- Do all weekly checks
- Clean dosing systems
- Check sand filter media
- Check corrosion, record and take corrective action
- Refer to manufacturers manuals for lubrication and maintenance procedures

SA 07.10.05 Maintenance Actions – Yearly

- Do all daily checks
- Do all weekly checks
- Do all monthly checks
- Check sand filter media levels and top up
- Check all electrical connections for tightness and corrosion on all terminals
- Refer to manufacturers manuals for lubrication and maintenance procedures

SA 07.10.06 Maintenance Actions – Three Yearly

- Do all daily checks
- Do all weekly checks
- Do all monthly checks
- Do all yearly checks
- Replace all motor bearings
- Replace all shafts seals

SA 07.11 SEWERAGE NETWORKS

SA 07.11.01 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 07.11.02 Sewerage Works

DAILY

- Remove screenings and rags to incinerator or burial for disposal
- Hose down the concrete slab where screenings and grit is deposited
- Check operation of the screenings removal and de-gritting equipment
- Record the flow meter totaliser in the log sheet
- Check that the correct diversion valve is open. Each septic tank must receive flow for 2 days followed by 4 days digestion time.
- Check flush chamber for floating and settled debris and remove to disposal
- Check that vertical flow reed bed isolating valve is open. Each vertical flow reed bed must receive water for 2 days followed by 4 days rest to allow water in the media to drain out and aerate the root zone
- Remove any non-biodegradable debris from the vertical reed bed media surface for disposal.
- Check surface distribution piping on vertical reed bed media surface for integrity and ensure that emitter openings are all open and end caps are fitted.
- Ensure that the vertical flow reed bed outlet valves are open and flowing freely through the 20mm ball valves. When flow to the plant reaches full capacity, the drain plugs and valves may be removed completely.
- Monitor water levels in horizontal flow reed beds. No surface water must be visible above the media.
- Monitor water levels in the evaporation / storage pond. If water accumulates faster than evaporation can take place, contact the local municipality to remove the contents with a suction tanker for disposal. Alternatively, this water can be utilized for irrigation.

WEEKLY

- Cut grass and remove weeds within fence
- Remove foreign objects from dams
- Execute daily procedures as described in daily procedures.
- Divert the flow to the next septic tank every 3rd day by operating the flow diversion valves upstream of the septic tanks

- Divert the flow to the next vertical flow reed bed every 3rd day by operating the isolating valve at the reed bed inlet
- Trim back overgrowth of reed runners that are outside the lining area.
- Keep all areas of the treatment plant neat and tidy by removing windblown litter and debris.
- Inspect the perimeter fence for damage and repair.
- Inspect all manholes and clean out debris, sand, etc

MONTHLY

- Cut grass and remove weeds within fence
- Remove foreign objects from dams
- Cut grass and remove weeds from dam edges
- Execute daily and weekly procedures as described in daily and weekly procedures.
- Take water samples of the effluent at the following points on the plant:
    - Raw sewage at the Single Quarters pump station sump
    - Septic tank effluent sample at the flush chamber
    - Vertical flow reed bed effluent at the inlet of the first horizontal flow reed bed
    - Final effluent from the last horizontal flow reed bed outlet.
    - Each sample to be a minimum of two (2) litres in volume.
    - Samples to reach a laboratory for analysis within 24 hours. Alternatively samples to be kept cool (± 4º C) until they reach the laboratory. This is required to inhibit bacterial activity and to ensure representative samples.
    - Take one biological sample of 250ml in volume of the Final effluent. Bacteriological samples must be taken in a sterilized glass bottle and properly sealed. Care must be taken not to touch the mouth of the bottle during sampling.
    - All chemical and bacteriological analysis results are to be kept on record by the operator

QUARTERLY

- Execute Daily, Weekly and Monthly procedures as described in above.
- De-sludge the septic tank sludge hoppers by operating the de-sludge valves.
    - First open the de-sludge valve located at the septic tank by using a valve spanner to fully open the valve.
    - Now open the knife-gate valve at the corresponding drying bed slowly.
    - Initially the liquid exiting from this valve will be clear and then will be followed by a burst of black liquefied sludge which is forced out of the septic tank sludge hopper due to the hydrostatic pressure.
    - When the liquid emerging from the knife-gate valve becomes clear, close the knife-gate valve first and then the valve at the septic tank. This is to ensure that sludge does not build up in the transfer pipe and harden over time.
    - This process typically does not take longer than 5 to 10 minutes.
    - It is essential that de-sludging takes place once every three (3) months when the interval is shorter, the sludge will not be fully digested. If left for too long, the weight of the water above the sludge will tend to compact it preventing it from flowing.
- Check lubricating levels of the reduction gearboxes on the screen & de-gritting equipment and top up if necessary
- Check glands on valves and tighten or replace if required.

ANNUAL

- Execute Daily, Weekly, Monthly and Quarterly procedures as described above.
- Once a year in September with the onset of the growing season, the vegetation on all the reed beds must be harvested. This is typically done by cutting off the plants at a height of 300mm above the media surface using either powered brush cutters or by hand using sickles. All cut off vegetation is to be removed from the media surface as far as possible. This action removes dead plants, leaves and debris and stimulates plant growth for the new season.
- The screening and de-gritting equipment must be serviced and inspected by the agents.
    - The complete unit must be drained and thoroughly cleaned using high pressure water cleaner.
    - Bearings/ bushes must be inspected for wear and play and may need to be replaced.
    - All lubricants in reduction gearboxes should be drained and replaced.
    - The screenings dewatering unit covers must be stripped and cleaned and then re-assembled.
    - Check electrical switchgear for functionality and tighten all terminations.
    - Check plc program and adjust operating intervals and periods if required.
- Check operation and condition of all valves on the plant. Repair and replace if necessary.

VIOOLSDRIF REED BED SEWAGE TREATMENT PLANT

Samples of effluent sampled on **DATE.** **Lab. Data Sheet No.**

	Septic Tank No.			Flush Tank	VF Reed Bed No.			HF Reed Bed No.		General Limit
	1	2	3		1	2	3	1	2	
pH (25°C)	7,36	7,63	7,58	7,66	7,61	7,16	7,24	7,32	8,10	5,5-9,5
Conductivity (at 25°C) mS/m)	-	-	-	208	185	308	233	235	197	150 (Feed+70)
Faecal Coli forms (organisms per 100ml)	-	-	-	-	-	-	-	-	Nil	1000max
	mg/l	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**
Chem. Oxygen Demand	197	213	126	142	31,6	59,2	63,1	55,2	39,4	75 Max (Algae Removed)
Total Kjeldahl Nitrogen	89,4	94,4	68,2	-	-		-	-		-
Ammonia Nitrogen	78,2	85,9	60,0	66,7	<0,15	0,96	14,9	0,36	<0,15	6 Max
Nitrate Nitrogen	-	-	-	7,2	1,0	2,5	5,0	0,76	0,50	15 Max
Nitrite Nitrogen	-	-	-	<0,08	<0,08	0,30	3,3	0,24	<0,08	
Total Suspended Solids	-	-	-	46	2	6	5	27	1	25 Max
Total Phosphate (as P)	7,4	8,2	7,0	-	-	-	-	-		-
Ortho Phosphate (as P)	-	-	-	9,2	0,80	6,4	2,9	<0,10	0,30	10 Max

SA 07.12 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 07.13 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 07.14 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 07.15 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 07.15.01 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 07.15.02 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 07.15.03 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 07.16 LOW VOLTAGE RETICULATION

SA 07.16.01 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 07.16.02 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 07.17 STANDBY POWER SYSTEMS

SA 07.17.01 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.

SA 07.17.02 Monthly maintenance

2. 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.

3. 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).

4. 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

5. Alternator shall be checked for accumulation of dust on the regulator and for any loose components.
6. Test run shall be undertaken, if possible on load, and volt, ampere and frequency readings recorded.

7. Alternator shall be cleaned and switched back into 'auto' mode.

8. Complete Standby Generator monthly log sheets

9. Record running hours, diesel consumption etc in the following prescribed format:

	Previous Measurement	This Measurement	Consumption	Average per day
Date:	01-Apr-20	03-May-20	Total	32 days
Diesel Tank Meter Reading (litres)	26542.2	30546.2	(litres) 4004.0	(litres/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	litres/hr

SA 07.17.03 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 07.18 <u>HEATING, VENTILATION AND AIR-CONDITIONING SYSTEMS</u>

SA 07.18.01 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 07.18.02 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 07.19 <u>FIRE FIGHTING EQUIPMENT</u>

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 07.19.01 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 07.19.02 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 07.19.03 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 07.19.04 Lister Engine: Monthly Maintenance

- Visual inspected and report on complete diesel engine as per manufacturers specifications.
- Check and log batteries
- Check oil level
- Check radiator water level
- Test engine for 30 minutes
- Check and log fuel, oil pressure and hest gauge reading
- Check and log rev counter reading
- Check and log hour meter reading
- Listen for unusual noises and vibrations

SA 07.19.05 Lister Engine: Annual Maintenance

- Visual inspected and report on complete diesel engine as per manufactures specifications.
- Check and log batteries
- Check oil level
- Check radiator water level
- Test engine for 30 minutes
- Check and log fuel, oil pressure and hest gauge reading
- Check and log rev counter reading
- Check and log hour meter reading
- Replace oil and oil filter
- Replace diesel filter
- Replace air filter
- Drain flush and refill the cooling system

- Listen for unusual noises and vibration
- Check the radiator fins and radiator fan blades for damage
- Replace the fan drive belt
- Check all external nuts, bolts and unions for tightness.
- Check hose conditions and connections

SA 07.19.06 Centrifugal Pump

Monthly maintenance responsibilities:

- Visually inspect and report on complete suction pump
- Check and inspect for leaks
- Listen for unusual noises and vibrations

Bi-Annual and Annual maintenance responsibilities:

- Check alignment of pump every 6 months of 1000 hours which ever comes first
- Change the oil every 5000 hours or 12 months which ever comes first
- On grease type bearings, grease the bearings every 2000 hours
- The bearings should be removed, serviced or replaced every 10000 hours or 2 years which ever comes first
- Sealed for life bearings require no maintenance. They should be checked every 6 months for sign of rough or noisy running.

SA 07.19.07 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 07.19.08 Motor Control Centre

Monthly maintenance responsibilities:

- Visually inspect and report on Motor Control Centre
- Check if all the lights on the panel are working
- Check operation of panel
- Check siren and beacon light
- Check charging rate of batteries
- Check panel batteries
- Check connections in panel

SA 07.20 <u>TELEMETRY</u>

SA 07.20.01 General

- The telemetry should be maintained on at least a 6 monthly basis. Preventative maintenance is the best approach – callouts and downtime can be minimised this way.
- Cleanliness and tidiness are the primary friends of any electronic system.

- Clean the outstation enclosure. Ensure the door seals are still intact to keep moisture and dust out. Keep the enclosure door closed at all times.
- Chesk for rust on enclosure. Apply chemical agent and touch up the affected areas as soon as possible.

SA 07.20.02 Communications

- The communication between the outstation and master should be monitored on a regular basis. This can be checked on the “Housekeeping” mimic on the SCADA.
- Check antenna and cables are intact and still mounted correctly. Inspect all connectors for functionality and cleanliness. Ensure no water ingress, dirt or corrosion has occurred. Correct if present.
- Check earthing to ensure it is as per original installation.

SA 07.20.03 Power Supply Battery

- Check the physical condition of batteries for damage, cracks, leakage etc. Replace if necessary or every 24 months.
- Measure the battery voltage. The float voltage should be between 13.5 and 13.8 VDC. If not suspect the battery charger setup.
- Switch mains OFF. The battery voltage should remain above 13 VDC. Key the radio and measure the battery voltage. It should dip to above 12VDC and return to original value after the radio is dekeyed. If not, suspect the battery.
- Check the physical earthing of the system – corrosion (or theft) of copper earthing cables, earth connectors etc.

SA 07.20.04 Telemetry Modules

- Inspect modules for physical damage etc.
- Ensure CPU is displaying relevant indication LEDs e.g. PWR, STATUS, POLL
- Ensure CPU is still polling modules as indicated by LED’s on the modules.
- Make a test input to each module and ensure that it is detected by the CPU and transmitted via the radio.
- Check all connectors for condition and conductivity.

SA 07.20.05 Functionality

A full functional test entails a complete commissioning of the telemetry outstation as per the project IO schedule. This allows for the testing and validation of all inputs and outputs from the source (transducer) all the way to the final display on the SCADA and HMI.

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-20	03-May-20	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-20	03-May-20	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 Sample wastewater effluent and chemical analyses to be provided by an authorised company on a monthly basis.

SA08.12 Statutory annual servicing of fire extinguishers.

SA08.13 Statutory annual servicing of fire hose reels.

SA08.14 Statutory annual servicing of fire hydrants.

SA08.15 Annual Pest control (internal and external)

SA 09 OPERATION OF INSTALLATIONS

SA 09.01 Wastewater Treatment Works

General operation of the wastewater treatment works shall be done in accordance with this specification, with Additional Specification SF: General Operations.

Daily procedures

- Remove screenings and rags to incinerator or burial for disposal
- Hose down the concrete slab where screenings and grit is deposited
- Check operation of the screenings removal and de-gritting equipment
- Record the flow meter totaliser in the log sheet
- Check that the correct diversion valve is open. Each septic tank must receive flow for 2 days followed by 4 days digestion time.
- Check flush chamber for floating and settled debris and remove to disposal
- Check that vertical flow reed bed isolating valve is open. Each vertical flow reed bed must receive water for 2 days followed by 4 days rest to allow water in the media to drain out and aerate the root zone
- Remove any non-biodegradable debris from the vertical reed bed media surface for disposal.
- Check surface distribution piping on vertical reed bed media surface for integrity and ensure that emitter openings are all open and end caps are fitted.
- Ensure that the vertical flow reed bed outlet valves are open and flowing freely through the 20mm ball valves. When flow to the plant reaches full capacity, the drain plugs and valves may be removed completely.
- Monitor water levels in horizontal flow reed beds. No surface water must be visible above the media.
- Monitor water levels in the evaporation / storage pond. If water accumulates faster than evaporation can take place, contact the local municipality to remove the contents with a suction tanker for disposal.
- Alternatively, this water can be utilized for irrigation

Weekly procedures

- Divert the flow to the next septic tank every 3rd day by operating the flow diversion valves upstream of the septic tanks
- Divert the flow to the next vertical flow reed bed every 3rd day by operating the isolating valve at the reed bed inlet.
- Trim back overgrowth of reed runners that are outside the lining area.
- Keep all areas of the treatment plant neat and tidy by removing windblown litter and debris.
- Inspect the perimeter fence for damage and repair.
- Inspect all manholes and clean out debris, sand, etc

Monthly procedures

- Raw sewage at the Single Quarters pump station sump
- Septic tank effluent sample at the flush chamber
- Vertical flow reed bed effluent at the inlet of the first horizontal flow reed bed
- Final effluent from the last horizontal flow reed bed outlet.
- Each sample to be a minimum of two (2) litres in volume.
- Samples to reach a laboratory for analysis within 24 hours. Alternatively samples to be kept cool (± 4º C) until they reach the laboratory. This is required to inhibit bacterial activity and to ensure representative samples.
- Take one biological sample of 250ml in volume of the Final effluent. Bacteriological samples must be taken in a sterilized glass bottle and properly sealed. Care must be taken not to touch the mouth of the bottle during sampling.
- All chemical and bacteriological analysis results are to be kept on record by the operator

Quarterly procedures

- First open the de-sludge valve located at the septic tank by using a valve spanner to fully open the valve.
- Now open the knife-gate valve at the corresponding drying bed slowly.
- Initially the liquid exiting from this valve will be clear and then will be followed by a burst of black liquefied sludge which is forced out of the septic tank sludge hopper due to the hydrostatic pressure.
- When the liquid emerging from the knife-gate valve becomes clear, close the knife-gate valve first and then the valve at the septic tank. This is to ensure that sludge does not build up in the transfer pipe and harden over time.
- This process typically does not take longer than 5 to 10 minutes.
- It is essential that de-sludging takes place once every three (3) months when the interval is shorter, the sludge will not be fully digested. If left for too long, the weight of the water above the sludge will tend to compact it preventing it from flowing.
- Check lubricating levels of the reduction gearboxes on the screen & de-gritting equipment and top up if necessary.
- Check glands on valves and tighten or replace if required

Annual procedures

- Once a year in September with the onset of the growing season, the vegetation on all the reed beds must be harvested. This is typically done by cutting off the plants at a height of 300mm above the media surface using either powered brush cutters or by hand using sickles. All cut off vegetation is to be removed from the media surface as far as possible. This action removes dead plants, leaves and debris and stimulates plant growth for the new season.
- The screening and de-gritting equipment must be serviced and inspected by the agents.
    - The complete unit must be drained and thoroughly cleaned using high pressure water cleaner.
    - Bearings/ bushes must be inspected for wear and play and may need to be replaced.
    - All lubricants in reduction gearboxes should be drained and replaced.
    - The screenings dewatering unit covers must be stripped and cleaned and then re-assembled.
    - Check electrical switchgear for functionality and tighten all terminations.
    - Check plc program and adjust operating intervals and periods if required.
- Check operation and condition of all valves on the plant. Repair and replace if necessary.

SA 09.01.01 General

The general operation 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, and 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 operation 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
02		Inlet works	
	01	Hand-raked screens: Remove screenings (rags, plastics, etc), ensuring that only degradable material is passed on to subsequent process units. (Last removal after evening peak flow)	2 hours during day
	02	Wash screenings and grit, and return degradable material to treatment train.	Hourly
	03	Dispose of screenings and grit by on-site burial.	Daily
03		Oxidation/maturation ponds	
	01	Remove floating material from trap at inlet to pond and dispose of by off-site removal.	Daily
	02	Remove tree and grass roots from verges of ponds.	Monthly
	03	Check leak detection facilities (if provided) for signs of leakage.	Monthly
	04	Ensure that surface growths are not accumulated in ponds.	Monthly
04		Aeration facilities	
	01	Check whether all aerators are operating.	Daily
	02	Check spray pattern of aerators and degree of turbulence in reactor.	Daily
	03	Check whether waste and return flow pumps are operating.	Daily
	04	Measure and record dissolved oxygen levels in reactor (average values and variations).	Daily
	05	Check dissolved oxygen levels for sudden drops (organic shock load), sudden increases (acute toxicity) or slow increase (chronic toxicity).	Daily
05		Re-circulation facilities	
	01	Check whether pumps are operating.	Daily
	02	Check return flow rates.	Monthly
06		Settling tanks	
	01	Scour settling tank and check for clumps of floating sludge.	Daily
	02	Remove scum and clean overflow weirs.	Daily
	03	Clean submerged portion of settling tank walls by pushing settled sludge on inclined surfaces down to the apex of the cone.	Monthly
07		Sludge drying beds	
	01	Apply sludge to drying beds in depths to suit climatic conditions, and remove when adequately dried.	Daily
	02	Keep sludge beds free of weed growth.	Daily
	03	Replenish filter media when required.	Event
08		Sludge disposal facilities	
	01	Remove tree and grass roots from verges of sludge lagoon.	Monthly
	02	Check leak detection facilities (if provided) for signs of leakage from lagoon.	Monthly
	03	Maintain hygienic conditions at sludge handling facilities.	Daily
09		Pump stations	
	01	Check operation and correct switching of pumps.	Daily
	02	Clean pump sumps.	Weekly
10		Bio filters	
	01	Check operation of dosing siphons and snifter pipes.	Daily

	02	Check operation of flow distribution pipes.	Daily
	03	Flush flow distribution pipes.	Weekly
	04	Check spread of flow and clean distribution nozzles/holes.	Weekly
	05	Evaluate, by means of measurement and calculation, flushing rates, frequency and duration.	6 Months
	06	Inspect health of biological growth on filter media.	Weekly
	07	Check occurrence of blockages, ponding and nuisance conditions on filter media.	Monthly
	08	Check operation of dosing and re-circulation pumps.	Daily
11		Chemical phosphate removal	
	01	Check operation of dosing equipment.	Daily
	02	Select chemicals and dosing rates by means of beaker tests. Ensure correct calculation of dosage concentration and dosing rates.	6 Months
	03	Check, by means of measurement and calculation, the accuracy of dosing rates and their control proportional to flow rate.	6 Months
	04	Manage provision, storage and control of chemicals.	Daily
	05	Ensure continuous dosing – avoid pulsing of dosing stream.	Daily
12		Disinfection	
	01	Check operation of chlorination facilities.	Daily
	02	Clean chlorine contact tank.	4 Months
	03	Ensure chlorine-dosing proportional to flow rate.	Weekly
13		Effluent disposal facilities	
	01	Oxidation ponds: Manage irrigation of effluent as means of disposal.	Daily
	02	Ensure erosion free discharge to receiving water body.	Monthly
14		Power supply	
	01	Check operation of stand-by generator where applicable.	Monthly

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 09.03 <u>Ozone Generator Plant</u>

General operation of the ozone generator plant works shall be done in accordance with this specification, with Additional Specification SF: General Operations.

SA 09.03.01 Daily Actions

- Check inlet and outlet valves of the cooling water.
- Check inlet and outlet valves of gas source.
- Check the pressure of the inlet gas source is in a regular value
- Check all valve positions
- Check that all feed pumps are running without vibration
- Check each system instrumentation's to detect parameter is normal range
- Check that the system has entered in a state of normal operation
- Check pressure gauges for normal readings
- Drain condensate from compressor
- Check for unusual noise and vibrations

SA 09.03.02 Weekly Actions

- Perform all daily checks as stated above
- Check the air-channel for gas leaks
- Check operation of the cooling fan
- Check the water pressure whether it is to standard
- Check the input voltage is within specified range
- Check the contactor of the refrigeration dryer
- Check the refrigeration dryer for damages
- Check the gas outlet pipe line whether it has back water

- Check ozone generator for water leaks
- Check oil levels of compressor
- Check, clean and lubricate motor bearings
- Check and inspect all air leaks

SA 09.03.02 Monthly Actions

- Perform all daily checks as stated above
- Perform all weekly checks as stated above
- Check gas valve
- Check temperature of IGBT is within range
- Check operation of temperature unit of IGBT
- Check flow switch for damages
- Check all wiring
- Check the inverter circuit.
- Check the IGBT drive line
- Inspect and clean inlet air-filter
- Inspect oil for contamination and replace if necessary
- Check operation of safety valves manually
- Clean and inspect cooling fins
- Check and inspect belt tension
- Clean after cooler externally
- Clean air flow of compressor internally

SA 09.03.02 Six-monthly Actions

- Perform all daily checks as stated above
- Perform all weekly checks as stated above
- Perform all monthly checks as stated above
- Replace all filters
- Service by ozone generator specialist

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 dysfunctional 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 dysfunctional 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

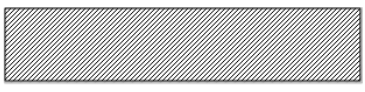
Line weight/width is extremely important and features such as the services should be drawn with lines that are more prominent. The following line weights (mm) can be used:

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 45º 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 Holdings (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.

Site Key Plan: Drawing Specifications

	Layer Specifications				
No	**Layers Name**	**Line type**	**Pen**	**Hatching**	**Description**
1	Paved Roads	1	1	None	All edges of paved section and top and bottom of kerbs, top and middle of side drains
2	Gravel Roads	2	1	None	All edges of gravel road, top and middle of side drains
3	Storm Water System	2	2	None	All storm water pipes, kerb inlets, surface inlets, pipe culvers and manholes
4	Sewer Pipe Lines	6	6	None	All sewer pipe lines with Ø of pipe indicated on each section between manholes
5	Sewer manholes	1	6	None	All manholes to be indicated with manhole no, top of manhole and invert level.
6	Water	11	11	None	All water pipe lines with Ø of pipe line indicated on line and boreholes
7	Electrical cables	9	14	None	All electrical cables with size of cable indicated on cable
8	Electrical Lights	1	14	None	All perimeter, street lights and area lighting
9	Telephone Lines	1	9	None	All overhead telephone lines
10	Fire Fighting Extinguishers	5	1	Pen 7, line type 1 at 90° angle	All fire extinguishers indicated with 0,5m radius circle with hatching, and numbered according to numbering on site
11	Fire Fighting Hose Reels	5	1	Pen 7, line type 1 at 90° angle	All fire hose reels indicated with rectangle of 0.5m x 0.75m with hatching, and numbered according to numbering on site
12	Fire Fighting Fire Hydrant	5	1	Pen 7, line type 1 at 90° angle	All fire hydrants indicated with a circle of 0.5m with hatching, and numbered according to numbering on site
13	Fire Fighting Fire Hydrant Hose Box	5	1	Pen 7, line type 1 at 90° angle	All fire hydrant hose boxes indicated with a rectangle of 0.75 x 1.5m
14	Buildings	2	1	Pen 13, line type 1 at 45° angle	All buildings, sewerage works, and water works, containers, search canopies and parkhomes, and water tanks
15	Fencing 1.2m high	18	7	None	All fencing and gate of 1,2m in height
16	Fencing 1,8m high	20	7	None	All fencing and gate of 1,8m in height
17	Fencing 3.0m high	24	7	None	All fencing and gate of 1,8m in height
18	Contours 1m	1	13	None	Contours in 1m intervals
19	Contours 5m	1	7	None	Contours in 5m intervals, with height indicated on contours at the end of the lines
20	Cadastral	1	3	None	Cadastral boundaries indicated on drawings with property name and number indicated
21	Banks Top	1	13	None	All top of banks
22	Banks Hatching	1	13	Standard bank hatch or lines	All bank hatching
23	Banks Bottom	5	13	None	All bottom of banks
24	Co-ordinate Grid	1	13	None	Grid to be in 50m intervals, full grid
	Text Specifications				
	Text type	**Pen**	**Font**	**Text Height**	**Description**
1	All normal text	1	Arial	3mm	
2	Table heading	5	Arial	5mm	
3	Table contents	1	Arial	3mm	
4	Co-ordinate Grid text	5	Arial	5mm	Grid co-ordinates to be on the edge of the drawing, within the title block frame
	Table Specifications				
	List of Tables	**Table Line Type**	**Table Pen**		**Description**
1	Buildings	1	2		All Building numbers with building type/name indicated in table
2	Fire Fighting Equipment	1	2		All Fire fighting equipment numbered, with type indicated in table
3	Air-Conditioners	1	2		All Air conditioners, in which building, make, and size indicated in table
4	Legend	1	2		Legend indicating Sewer, Water, Electrical Cables, Fencing, Fire Fighting Equipment
	General				
1	Place frame around drawing area, no title block				
2	Indicate Scale on drawing				
3	Drawing to fit on A0 sheet.				
4	Drawing Space to be 800mm x 1050mm on 1:1 Scale				
5	Drawing to be in landscape orientation				
6	Tables to be placed in drawing space				
7	North indicator to be placed in top right hand corner of drawing space				
8	No blocks or patterns must be used, if drawing is generated by AutoCAD				
9	If AutoCAD is used to generate drawings, drawing must be done in layout mode and not model space				
10	Direction and name of nearest town should be indicated on drawings				Text 5mm high
11	Scale bar to be placed on bottom right hand corner				
12	Scale Should be one of the following - 1:100, 1:200, 1:500, 1:1000				
13	Key to layout of sheets to be placed in title block				

Ablution: Daily Checklist Sheet per Month

Port of Entry: _____ **Month:** _____

Ablution description: _____ **Inspected by:** _____

	ITEM	TASK	Date / Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Sanitary	1	Floors clean																																
	2	Walls & windows clean																																
	3	Toilets clean																																
	4	Toilet seats clean																																
	5	Urinal clean																																
	6	Taps clean																																
	7	Wash hand basins clean																																
	8	Wall mounted bins cleaned of paper																																
	9	Sanitary She bins (in female toilets) clean																																
Consumables	10	Sufficient Toilet paper																																
	11	Sufficient Air fresheners																																
	12	Sufficient Soap in dispensers																																
Building components	13	Doors in working order																																
	14	Door handles operational																																
	15	Indicator bolts working																																
	16	Hand dryer unit working																																
	17	Lights in working condition																																
	18	Mirrors and other fittings in good order																																
	19	Toilet cistern flushing mechanisms operational																																
	20	Urinal flushmasters fully operational																																
	21	Taps not leaking																																
	22	Toilet Seats OK																																

Breakdowns logged with Call Centre:

1 Date reported: _____ Time reported: _____ Call Centre Reference Number: _____ Attended to? Yes No

2 Date reported: _____ Time reported: _____ Call Centre Reference Number: _____ Attended to? Yes No

3 Date reported: _____ Time reported: _____ Call Centre Reference Number: _____ Attended to? Yes No

4 Date reported: _____ Time reported: _____ Call Centre Reference Number: _____ Attended to? Yes No

5 Date reported: _____ Time reported: _____ Call Centre Reference Number: _____ Attended to? Yes No

Checked by Port Coordinator: _____ **Engineer:** _____

ADDITIONAL SPECIFICATION

SB OPERATING AND MAINTENANCE MANUALS

CONTENTS

SB 01 SCOPE
SB 02 PROCEDURE FOR SUBMISSION OF MANUALS
SB 03 FORMAT OF OPERATING AND MAINTENANCE MANUALS
SB 04 CONTENTS
SB 05 MEASUREMENT AND PAYMENT

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
SD 02 BASIC METHOD REQUIREMENT
SD 03 TRAINING OF USER CLIENT PERSONNEL
SD 04 TRAINING OF PERSONNEL

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
SF 02 OPERATION REQUIREMENTS
SF 03 OPERATION CONTROL
SF 04 COMMUNICATION
SF 05 PERFORMANCE MEASUREMENT
SF 06 MEASUREMENT AND PAYMENT

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
SH 02 DEFINITIONS AND ABBREVIATIONS
SH 03 BASIC METHOD REQUIREMENT
SH 04 HIV/AIDS AWARENESS EDUCATION AND TRAINING
SH 05 PROVIDING WORKERS WITH ACCESS TO CONDOMS
SH 06 ENSURING ACCESS TO HIV/AIDS TESTING AND COUNSELLING FACILITIES AND TREATMENT OF SEXUALLY TRANSMITTED INFECTIONS (STI)
SH07 APPOINTMENT OF AN HIV/AIDS AWARENESS CHAMPION
SH08 MONITORING

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 IN CONSTRUCTION PROJECTS, REPAIRS, RENOVATIONS & MAINTENANCE

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SI 01 PREAMBLE

In terms of Construction Regulation 4(1)(*a*) of the Occupational Health and Safety Act, 1993 (Act 85 of 1993), and 5(1) construction regulation of 2014, the Department of Public Works, as the Client and/or its Agent on its behalf, shall be responsible to prepare Health & Safety Specifications for any intended construction project and provide any Principal Contractor who is making a bid or appointed to perform construction work for the Client and/or its Agent on its behalf with the same.

The Client's further duties are as described in The Act and the Regulations made thereunder. The Principal Contractor shall be responsible for the Health & Safety Policy for the site in terms of Section 7 of the Act and in line with Construction Regulation 5 as well as the Health and Safety Plan for the project.

This 'Health and Safety Specifications' document is governed by the "Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), hereinafter referred to as 'The Act'. Notwithstanding this, cognizance should be taken of the fact that no single Act or its set of Regulations can be read in isolation. Furthermore, although the definition of Health and Safety Specifications stipulates 'a documented specification of all health and safety requirements pertaining to associated works on

a construction site, so as to ensure the health and safety of persons', it is required that the entire scope of the Labour legislation, including the Basic Conditions of Employment Act be considered as part of the legal compliance system. With reference to this specification document this requirement is limited to all health, safety and environmental issues pertaining to the site of the project as referred to here in. Despite the foregoing it is reiterated that environmental management shall receive due attention.

Due to the wide scope and definition of construction work, every construction activity and site will be different, and circumstances and conditions may change even on a daily basis. Therefore, due caution is to be taken by the Principal Contractor when drafting the Health and Safety Plan based on these Health and Safety Specifications. Prior to drafting the Health and Safety Plan, and in consideration of the information contained here-in, the contractor shall set up a Risk Assessment Program to identify and determine the scope and details of any risk associated with any hazard at the construction site, in order to identify the steps needed to be taken to remove, reduce or control such hazard. *This Risk Assessment and the steps identified will be the basis or point of departure for the Health and Safety Plan.* The Health and Safety Plan shall include documented 'Methods of Statement' (see definitions under Construction Regulations) detailing the key activities to be performed in order to reduce as far as practicable, the hazards identified in the Risk Assessment.

The Department of Public Works is tasked to provide accommodation and operational facilities to a very large proportion of the approximate 35 National Departments responsible for the governance of the Department of Public Works. A very large number of State employees and public users of the facilities and the services provided there-in directly interacts with the facilities provided by the well-being, health and safety of a great number of people. This Department thus has directly or indirectly, an impact on the Republic of South Africa as well as the National Parliament.

In this a high premium is to be placed on the health and safety of the most valuable assets of the Department of Public Works. These are its personnel, the personnel of its Clients and the physical assets of which it is the custodian and may also include the public as well. The responsibilities the Department and relevant stakeholders have toward its employees and other people present in the facilities or on the sites are captured further in this specification document. These responsibilities stem from both moral, civil and a variety of legal obligations. The Principal Contractor is to take due cognisance of the above statement.

Every effort has been made to ensure that this specification document is accurate and adequate in all respects. Should it however, contain any errors or omissions they may not be considered as grounds for claims under the contract for additional reimbursement or extension of time, or relieve the Principal Contractor from his responsibilities and accountability in respect of the project to which this specification document pertains. Any such inaccuracies, inconsistencies and/or inadequacies must immediately be brought to the attention of the Agent and/or Client.

SI 02 SCOPE OF HEALTH AND SAFETY SPECIFICATION DOCUMENT

These Specifications should be read in conjunction with the Act, the Construction Regulations and all other Regulations and Safety Standards which were or will be promulgated under the Act or incorporated into the Act and be in force or come into force during the effective duration of the project. The stipulations in this specification, as well as those contained in all other documentation pertaining to the project, including contract documentation and technical specifications shall not be interpreted, in any way whatsoever, to countermand or nullify any stipulation of the Act, Regulations and Safety Standards which are promulgated under, or incorporated into the Act.

SI 03 PURPOSE

The Department is obligated to implement measures to ensure the health and safety of all people and properties affected under its custodianship or contractual commitments, and is further obligated to monitor that these measures are structured and applied according to the requirements of these Health and Safety Specifications.

The purpose of this specification document is to provide the relevant Principal Contractor (and his /her contractor) with any information other than the standard conditions pertaining to construction sites which might affect the health and safety of persons at work and the health and safety of persons in connection with the use of plant and machinery; and to protect persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work during the carrying out of construction work for the Department of Public Works. The Principal Contractor (and his /her contractor) is to be briefed on the significant health and safety aspects of the project and to be provided with information and requirements on inter alia:

a) Safety considerations affecting the site of the project and its environment;
b) Health and safety aspects of the associated structures and equipment;
c) submissions on health and safety matters required from the Principal Contractor (and his /her contractor); and
d) the Principal Contractor's (and his /her contractor) health & safety plan.

To serve to ensure that the Principal Contractor (and his /her contractor) is fully aware of what is expected from him/her with regard to the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and the Regulations made there-under including the applicable safety standards, and in particular in terms of Section 6,7 and 8 of the construction regulation (2014).

To inform the Principal Contractor that the Occupational Health and Safety Act, 1993 (Act 85 of 1993) in its entirety shall apply to the contract to which this specification document applies. The Construction Regulations promulgated on 07 February 2014.

SI 04 DEFINITIONS

- The most important definitions in the Act and Regulations pertaining to this specification document are hereby extracted.

"Purpose of the Act" – To provide for the health and safety of persons at work and the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety; and to provide for matters connected therewith.

"Health & Safety Specification" – means a document that includes information required under the construction regulation and obtained from the clients & designers during the early planning & design stage for a specific project on a specific site for use by the contractors when preparing their tenders or bids to clients.

"Health & Safety Plan" – means a document which is site specific and includes all identified hazards, safe work procedures to mitigate, reduce & control the hazards identified in a project.;

"Agent" – means any person who acts as a representative for a client;

"Client" – means any person for whom construction work is performed;

“ Construction Health & Safety Agent (SACPCMP)” – The person or entity appointed by the client through the Agent and who has a full authority and obligation to act on the client’s behalf in terms of the construction regulations;

‘‘Construction Work’’ is defined as any work in connection with –

the erection, maintenance, alteration, renovation, repair, demolition or dismantling of or addition to a building or any similar structure;
the installation, erection, dismantling or maintenance of a fixed plant where such work includes the risk of a person falling;
the construction, maintenance, demolition or dismantling of any bridge, dam, canal, road, railway, runway, sewer or water reticulation system or any similar civil engineering structure; or
the moving of earth, clearing of land, the making of an excavation, piling, or any similar type of work;

“Contractor” – means an employer, as defined in Section 1 of the Act, who performs construction work and includes Principal Contractors;

“Contract Amount” Financial value of the contract at the time of the award of the contract, exclusive of all allowance and any value added tax or sales tax, which the law requires the employer to pay to the contractor.

“Practical Completion Certificates” A certificates issued in terms of a contract by the employer, signifying that the whole of the construction works have reached a state of readiness for occupation or use for the purposes intended, although some minor work may be outstanding.

“Accident” – means unplanned occurrence that happens due to the unsafe condition and may cause injury to a person, damage to the property, material, plant, equipment and the environment;

“Hazard” – means anything including work activities and practices with the potential to cause harm;

“Risk” – means the likelihood that harm will occur and the subsequent consequences.

“Risk assessment” – means a process to determine any risk associated with any hazard at a construction site in order to identify the steps needed to be taken to mitigate, reduce or control such hazards.

Health and Safety File” – means a file, or other record in permanent form, containing the information required a contemplated in the regulations;

SI 05 OCCUPATIONAL HEALTH & SAFETY MANAGEMENT

5.1 Structure and Organization of OH&S Responsibilities

5.1.1. *Overall Supervision and Responsibility for OH&S*

The Client and/or its Agent on its behalf to ensure that the Principal Contractor, appointed in terms of Construction Regulation 4(1)(c), implements and maintains the agreed and approved H&S Plan. Failure on the part of the Client or Agent to comply with this requirement will not relieve the Principal Contractor from any one or more of his/her duties under the Act and Regulations.

The Chief Executive Officer of the Principal Contractor in terms of Section 16 (1) of the Act to ensure that the Employer (as defined in the Act) complies with the Act. The pro forma Legal

Compliance Audit may be used for this purpose by the Principal Contractor or his/her appointed contractor.

All OH&S Act (85 /1993), Section 16 (2) appointee/s as detailed in his/her/their respective appointment forms to regularly, in writing, report to their principals on matters of health and safety per routine and ad hoc inspections and on any deviations as soon as observed, regardless of whether the observation was made during any routine or ad hoc inspection and to ensure that the reports are made available to the principal Contractor to become part of site records (Health & Safety File).

The Construction Supervisor and Assistant Construction Supervisor/s appointed in terms of Construction Regulation 6 to regularly, in writing, report to their principals on matters of health and safety per routine and ad hoc inspections and on any deviations as soon as observed, regardless of whether the observation was made during any routine or ad hoc inspection and to ensure that the reports are made available to the principal Contractor to become part of site records (Health & Safety File).
All Health and Safety Representatives (SHE-Reps) shall act and report as per Section 18 of the Act.

5.12 Required appointments as per the Construction Regulations:

Item	Regulation	Appointment	Responsible Person
	3.	Application Construction work permit	Client
	5(1)(k)	Principal contractor for each phase or project	Client
	5(6)	Construction Health & Safety Agent	Client
	7.(1)(c)	Contractor	Principal Contractor
	7(3)	Contractor	Contractor
	8(1)	Construction manager	Contractor
	8(2)	Assistance Construction manager	Contractor
	6(1)	Construction supervisor	Contractor
	6(2)	Construction supervisor sub-ordinates	Contractor
	8(5)	Construction Safety Officer	Contractor
	8(8)	Responsible employee	
	9(1)	Person to carry out risk assessment	Contractor
	10(1)	Fall protection planner	Contractor
	12(1)	Temporal work designer	
	12(2)	Supervisor of temporal work operation	
	13(1)	Excavation supervisor	Contractor
	13(2)(k)	Competent person in the use of explosive for excavations	Contractor
	14(11)	Explosives expert	Contractor
	14(1)	Supervisor demolition work	Contractor
	14(2)	Scaffold supervisor	Contractor
	16(1)	Suspended platform supervisor	Contractor
	18(1)a	Rope access	Contractor
	19(8)(a)	Material hoist inspector	Contractor
	20(1)	Bulk mixing plant supervisor	Contractor
	21(2)	Explosive actuated fastening device inspector	Contractor
	21(2)(g)	Explosive actuated fastening device cartridge, nails and studs: issuer & collector	Contractor
	23 (1)	Operator : construction vehicle and mobile plant	Contractor
	28 (a)	Stacking and storage supervisor	Contractor
	29 (h)	Fire equipment inspector	Contractor

5.2 ***Communication, Participation & Consultation***

5.2.1 Occupational Health & Safety matters/issues shall be communicated between the Employer, the Principal Contractor, the other Contractors, the Designer and other concerned parties shall be through the H&S Committee or other means determined by the client.

5.2.2 In addition to the above, communication may be directly to the Client or his appointed Agent, verbally or in writing, as and when the need arises.

5.2.3 Consultation with the workforce on OH&S matters will be through their Supervisors and H&S Representatives ('SHE – Reps')

5.2.4 The Principal Contractor will be responsible for the dissemination of all relevant OH&S information to the other Contractors e.g. design changes agreed with the Client and/or its Agent on its behalf and the Designer, instructions by the Client and/or his/her agent, exchange of information between Contractors, the reporting of hazardous/dangerous conditions/situations etc.

SI 06 INTERPRETATION

The Occupational Health and Safety Act and all its Regulations, with the exception of the Construction Regulations, distinguish between the roles, responsibilities and functions of employers and employees respectively. It views consultants and contractors as employees of the "owner" of a construction or operational project, the "owner" being regarded as the employer.

(The position taken by the Construction Regulations is that the "owner", in terms of its instructions, operates (has to operate) in the role of client as per relevant definition. The contractors working for the "client" are seen to be in two categories, i.e. the Principal Contractor and Contractors.

The Principal Contractor has to take full responsibility for the health and safety on the site of the relevant project / contract. This includes monitoring health and safety conditions and overseeing administrative measures required by the Construction Regulations from all contractors on the project site.

SI 07 RESPONSIBILITIES

7.1 Client

The Client or his appointed Agent on his behalf will appoint each Principal Contractor for this project or phase/section of the project in writing for assuming the role of Principal Contractor as intended by the Construction Regulations.

The Client or his appointed Agent on his behalf shall discuss and negotiate with the Principal Contractor the contents of the health and safety plan of the both Principal Contractor and Contractor for approval.

The Client or his appointed Agent on his behalf will take reasonable steps to ensure that the health and safety plan of both the Principal Contractor and Contractor is implemented and maintained. The steps taken will include periodic audits at intervals of at least once every month.

The Client or his appointed Agent on his behalf, will prevent the Principal Contractor and/or the Contractor from commencing or continuing with construction work should the Principal Contractor and/or the Contractor at any stage in the execution of the works be found to:

- have failed to have complied with any of the administrative measures required by the Construction Regulations in preparation for the construction project or any physical preparations necessary in terms of the Act;
- have failed to implement or maintain their health and safety plan;
- have executed construction work which is not in accordance with their health and safety plan; or
- act in any way which may pose a threat to the health and safety of any person(s) present on the site of the works or in its vicinity, irrespective of him/them being employed or legitimately on the site of the works or in its vicinity.

7.2 Principal Contractor

The Principal Contractor shall accept the appointment under the terms and Conditions of Contract. The Principal Contractor shall sign and agree to those terms and conditions and shall, before commencing work, notify the Department of Labour of the intended construction. Annexure 2 of this construction regulation contains a “Notification of Construction Work” form. The Principal Contractor shall submit the notification in writing prior to commencement of work and inform the Client or his Agent accordingly.

The Principal Contractor shall ensure that he is fully conversant with the requirements of this Specification and all relevant health and safety legislation.

The Principal 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 or which may perceivable be applicable to this contract.

The Principal Contractor shall provide and demonstrate to the Client 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 has to take responsibility in terms of this contract.

The Principal Contractor shall provide proof of his registration and good standing with the Compensation Fund or with a licensed compensation insurer prior to commencement with the works.

The Potential Principal Contractor shall, in submitting his tender, demonstrate that he has made provision for the cost of compliance with the specified health and safety requirements, the Act and Construction Regulations. (Note: This shall have to be contained in the conditions of tender upon which a tenderer’s offer is based.)

The Principal Contractor shall consistently demonstrate his competence and the adequacy of his resources to perform the duties imposed on the Principal Contractor in terms of this Specification, the Act and the Construction Regulations.

The Principal Contractor shall ensure that a copy of his health and safety plan is available on site and is presented upon request to the Client, an Inspector, Employee or Sub-contractor.

The Principal Contractor shall ensure that a health and safety file, which shall include all documentation required in terms of the provisions of this Specification, the Act and the Construction Regulations, is opened and kept on site and made available to the Client or Inspector upon request. Upon completion of the works, the Principal Contractor shall hand over a consolidated health and safety file to the Client.

The Principal Contractor shall, throughout execution of the contract, ensure that all conditions imposed on his Sub-contractors in terms of the Act and the Construction Regulations are complied with as if they were the Principal Contractor.

The Principal Contractor shall from time to time evaluate the relevance of the Health and Safety Plan and revise the same as required, following which revised plan shall be submitted to the Client and/or his/her Agent for approval.

7.3 Contractor

The contractor must demonstrate to the Principal Contractor that he has the necessary competencies and resources to perform the construction work safely.

7.4 Responsibilities of Construction Health & Safety Agent (SACPCMP)

The construction Health & Safety Agent act as a link between the client, Principal Contractor and the project team members with respect to health & Safety, they are required to ensure that the client carry out its H&S responsibilities in terms of legislation as well as to co-ordinate and ensure good H&S practices are maintained throughout the duration of the project. In many cases this role starts from project initiation to project close-out.

a) H&S competence*:* In the event that the client is unable to satisfy the requirements of the Construction Regulations for whatever reasons, the construction H&S agent may be appointed to perform these functions on behalf of the client. Given the need to appoint a registered construction H&S agent that is competent and adequately resourced with respect to H&S matters.

b) H&S goals*:* It is important that the construction H&S agents demonstrate clearly to clients how they are going to contribute to the achievement of any client H&S goals and objectives. They should also set their own H&S goals.

c) H&S responsibilities*:* Prior to accepting the H&S agent appointment from clients, H&S agents need to ensure that they brief clients fully on the client's particular responsibilities in terms of the OH&SA of 1993 and Construction Regulations as amended from time to time. In the absence of acceptance by clients of these responsibilities, H&S agents will not be able to adequately meet their own H&S responsibilities and duties.

d) H&S information: H&S agents must provide the designer or design team with all H&S information to enable them to conduct a design HIRA to identify the significant hazards that need to be included in the H&S specification. This information may be gathered from multiple sources such as, for example, discussion with the client, previous historical use of the site or facility, previous surveys and investigations and past H&S files.

SI 08 SCOPE OF WORK

These specifications are applicable to the specific scope of work pertaining to the above-mentioned project as detailed in the tender documents, this amongst all includes for example:

- Repair and Maintenance work
- Operation of installations
- Construction, erecting, alteration, renovations, refurbishment, repairs, demolishing or dismantling of building and structures.
- Site clearance
- Site hoarding, demarcation and demolition works
- Excavations, filling, compaction, evening surface
- Piling (by drilling, excavating)
- Temporal works
- Construction, erecting, alteration, renovations, refurbishment, repairs, demolishing or dismantling of any bridge, dam, canal, road, railway, runaway, sewer, or water reticulation system or any civil engineering structure or type of work

SI 09 PREPARING A HEALTH & SAFETY PLAN

The level of detail required for a H&S plan will depend on how complex the workplace is (in particular, the number of contractors at the workplace at any one time) and the risks involved in the work. The plan must be easily accessible in a construction site and it must be clearly understood by management, supervisors & workers on construction site.

The plan must be implemented, maintained and kept up to date during the construction of the project.

The principal contractor should prepare an H&S plan that includes:

- project information;
- client requirements for H&S management on the project;
- Environmental restrictions and existing on-site risks arrangements, imposed by others or developed by the principal contractor, to control significant site H&S risks; H&S file & project H&S review.

The H&S plan should include the following information:

- details of the client, that is the person commissioning the construction work, for example their name, representative and contact details;
- details of the principal contractor;
- details of the construction project, for example address of the workplace, anticipated start and end date and a brief description of the type of construction work that the H&S plan will cover;
- details on how subcontractors will be managed and monitored, including how the principal contractor intends to implement and ensure compliance with the H&S plan such as checking on the performance of subcontractors and how non-compliance will be handled; and details on how the risks associated with falls, falling objects, moving plant, electrical work and all high risk construction work that will take place on a construction project will be managed.

The H&S plan should also include information on:

- the provision and maintenance of a hazardous chemicals register, safety data sheets and hazardous chemicals storage;
- the safe use and storage of plant;
- the development of a construction project traffic management plan;
- obtaining and providing essential services information – electrical, gas, telecom, water and similar services;
- workplace security and public safety; and
- ensuring workers have appropriate licences and training to undertake the construction work.

The H&S plan must contain:

- a general description of the type of work activities involved in the project and not just a description of the facility to be constructed;
- the project program or schedule details, including start and finish dates, showing principal activities;
- details of client, design team, principal contractor, subcontractors, and major suppliers; and
- extent and location of relevant existing records, surveys, site investigation and geotechnical reports, 'as-built' plans, H&S files.

SI 10 HEALTH AND SAFETY FILE

The H&S file is a document prepared by the principal contractor containing important project H&S information for use by the owner of the completed structure after construction has been completed.

The principal contractor is responsible for producing an H&S file. It contains important project H&S information for use by the owner of the completed structure after construction has been completed. It is essential that the process of compiling the file commence as early as possible to ensure sufficient time to gather the required information.

The Principal Contractor must, in terms of Construction Regulation 7(7), keep a Health & Safety File on site at all times that must include all documentation required in terms of the Act and Regulations and must also include a list of all Contractors on site that are accountable to the Principal Contractor and the agreements between the parties and details of work being done. A more detailed list of documents and other legal requirements that must be kept in the Health & Safety File.

The contractor must ensure that the client's format and layout of the H&S file is adhered to. The contractor must identify the responsible person that will prepare the H&S file and who will be responsible for the drafting of as-built drawings. The contractor must establish procedures:

The Health and Safety File will remain the property of the Client and/or its Agent on its behalf throughout the period of the project and shall be consolidated and handed over to the Client and/or its Agent on its behalf at the time of completion of the project.

SI 11 OH&S GOALS AND OBJECTIVES AND ARRANGEMENTS FOR MONITORING AND REVIEWING OH&S PERFORMANCE

The Principal Contractor is required to maintain an acceptable disabling incident frequency rate (DIFR) and report on this to the Client and/or its Agent on its behalf on a monthly basis.

11.1 IDENTIFICATION OF HAZARDS AND DEVELOPMENT OF RISK ASSESSMENTS, STANDARD WORKING PROCEDURES (SWP) AND METHOD STATEMENTS

The Principal Contractor is required to develop Risk Assessments, Standard Working Procedures (SWP) and Method Statements for each activity executed in the contract or project.

The identification of hazards is over and above the hazards identification programme and those hazards identified during the drafting of the Health and Safety Plan.

11.1.1 Monthly Audit by Client and/or its Agent.

The Client and/or its Agent on its behalf will be conducting Periodic Audits at times agreed with the Principal Contractor Audit to comply with Construction Regulation 4(1)(*d*) to ensure that the principal Contractor has implemented, is adhering to and is maintaining the agreed and approved OH&S Plan.

A representative of the Principal Contractor and the relevant Health and Safety Representative(s) (SHE-Reps) must accompany the Client 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 Client 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 Employer for reference purposes.

11.1.2 Health & Safety incident/accident reporting & investigations

The Principal 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 spilled
- 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 days and at the same time to the Client and/or its Agent on its behalf.

The Principal Contractor is required to provide the Client and/or its Agent on its behalf with copies of all statutory reports required in terms of the Act and the Regulations.

The Principal Contractor is required to provide the Client and/or its Agent on its behalf with a monthly “SHE Risk Management Report”.

The Principal Contractor is required to provide a.s.a.p. the Client and/or its Agent on its behalf with copies of all internal and external accident/incident investigation reports.

The Principal Contractor is responsible to oversee the investigation 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 Principal 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 Principal Contractor is responsible for the investigation of all 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.

Determine the underlying H&S deficiencies and other contributory factors Identification of corrective/preventative actions and continual improvement communicating the outcome/results and documenting the events of the investigation.

Reporting Of Near-Misses

The Department of Public Works views the reporting of near misses as a critical component in creating a positive health and safety awareness culture on site.

The Department of Public Works retains the right to enforce the reporting of near misses within 24 hours of occurrence.

SI 12 REVIEW

The Principal Contractor is to review the Hazard Identification, Risk Assessments and Standard Work Processes at each Production Planning and Progress Report meeting 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 the Client 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.

12.1 Site Rules and other Restrictions

Site OH&S Rules

The Principal Contractor must develop a set of site-specific OH&S rules that will be applied to regulate the Health and Safety Plan and associated aspects of the construction. When required for a site by law, visitors and non-employees upon entering the site shall be issued with the proper Personal Protective Equipment (PPE) as and when necessary.

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. The Principal Contractor must develop a set of Security rules and procedures and maintain these throughout the construction period.

If not already tasked to the H&S Officer appointed in terms of Construction Regulation, the Principal Contractor must appoint a competent person who must develop contingency plans for any emergency that may arise on site as indicated by the risk assessments.

12.1.1 Appointment of Health & Safety Representatives

H&S Representatives('SHE – Reps')

Where the Principal Contractor employs more than 20 persons (including the employees of other Contractors (sub-contractors) he 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 must be appointed 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.

Duties and Functions of the H&S Representatives

The Principal Contractor must ensure that the designated H&S Representatives conduct at least a weekly inspection of their respective areas of responsibility using a checklist developed by a Principal Contractor.
The report must be consolidated and submitted to the Health & Safety Committee.
H&S Representatives must form part of the incident/accident investigating team.

12.1.3 Establishment of H&S Committee(s)

The Principal Contractor must establish H&S 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 a 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, an agreed Agenda for the first meeting. Thereafter the H&S Committee shall determine its own procedures.

12.1.4 Training & Awareness

The contents and syllabi of all training required by the Act and Regulations including any other related or relevant training as required must be included in the Principal Contractor's Health and Safety Plan and Health and Safety File.

Training & Induction

All employees performing work or task on site that potentially impact on H&S must be competent & have the necessary appropriate education, training & experience.

All the training must be closely aligned with the risk profile of the project; procedures must be put in place to ensure that all workers are aware of the consequences of their work activities & benefits of improved H&S performance.

All employees of the Principal and other Contractors must be in possession of proof of General Induction training

Site Specific Induction Training

All employees of the Principal and other Contractors must be in possession of Site Specific Occupational Health and Safety Induction or other qualifying training.

Other Training

All operators, drivers and users of construction vehicles, mobile plant and other equipment must be in possession of valid proof of training.

SI 13 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, Standard Working Procedures (SWP), management and control measures and Method Statements (where necessary) have to be developed by the Principal Contractor:

- Clearing & grabbling the area/site
- Site establishment
- Dealing with existing structures
- Location of existing services
- Boundary & Access control/Public liability exposures
- Protection against heat exhaustion, dehydration, wet & cold conditions
- Dealing with HIV & aids other related diseases
- Use of portable electrical & explosive tools
- Any Excavation work
- Any welding work
- Loading & offloading of trucks
- Driving & operations of Construction vehicles & mobile plant
- Temporal works and
- Construction work as defined in the construction regulation 2014

SI 14 OUTLINED DATA, REFERENCES AND INFORMATION ON CERTAIN AND/OR SPECIFIC OBLIGATORY REQUIREMENTS TO ENSURE COMPLIANCE

Administrative & Legal Requirements

OHS Act Section/ Regulation	Subject	Requirements
Construction. Regulation	**Notice of carrying out Construction work**	Department of Labour notified Copy of Notice available on Site
General Admin. Regulation 4	**Copy of OH&S 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. Regulation 4 & 5(1)	H&S Specification & Programme	H&S Spec received from Client and/or its Agent on its behalf OH&S 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 OH&S 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 Regulations 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 Mandatories/ (Sub-)Contractors**	Written agreement with (Sub-)Contractors List of Subcontractors 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. (Annexure 1)(WCL 1 or 2) and to the Client 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 Incidents**	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 appointed to draw up 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 Driven Machinery Regulations 18 & 19	Cranes & Lifting Machines Equipment	Competent person appointed in writing to inspect Cranes, Lifting Machines & Equipment Written Proof of Competence of above appointee available on Site. Cranes & Lifting tackle identified/numbered Register kept for Lifting Tackle Log Book kept for each individual Crane Inspection: - All cranes - **daily by operator** Tower Crane/s - **after erection/6monthly** Other cranes - **annually by comp. person** - Lifting tackle(slings/ropes/chain slings etc.) - daily or before every new application

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 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 OH&S 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 GSR 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 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
General Safety Regulation 13A	**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

SI 15 THE PRINCIPAL CONTRACTOR'S GENERAL DUTIES

The Principal 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 Principal 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 the client or his representative whenever necessary or on request to an interested party.
The project under control of the Principal Contractor shall be subject to periodic health and safety audits that will be conducted by the client at intervals agreed upon between the Principal Contractor and the client, provided such intervals will not exceed periods of one month.
The Principal Contractor is to ensure that he/she and all persons under his control on the construction site shall adhere to the above specifications.
The Principal 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 16 THE PRINCIPAL CONTRACTOR'S SPECIFIC DUTIES

The Principal Contractor's specific duties in terms of these specifications are detailed in the Construction Regulations as published under government notice 07 August 2014, stipulated in Section 7.

SI 17 THE PRINCIPAL CONTRACTOR'S SPECIFIC RESPONSIBILITIES WITH REGARD TO HAZARDOUS ACTIVITIES

The following examples of 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:

- Fall protection
- Structures
- Excavation work
- Demolition work
- Scaffolding
- Construction vehicles & mobile plant
- Water environments
- Housekeeping on construction sites
- Fire precautions on construction sites

This list 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 the client or his representative, or on request to an interested party.

SI 18 GENERAL NOTES TO THE PRINCIPAL 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:

- The latest issue of SABS 0142: "Code of Practice for the Wiring of Premises"
- The Local Government Ordinance 1939 (Ordinance 17 of 1939) as amended and the municipal by-laws and any special requirements of the local supply authority
- The Fire Brigade Services Act 1987, Act 99 of 1987 as amended
- The National Building Regulations and Building Standards Act 1977 (Act 103 of 1977) as amended and relevant proclaimed Regulations (SABS 0400)
- The Post Office Act 1958 (Act 44 of 1958) as amended
- The Electricity Act 1984, Act 41 of 1984
- 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
- Legislation pertaining to water usage and the environment
- Legislation governing the use of equipment, which may emit radiation (e.g. X-Rays etc.)
- Common Law

SI 19 HOUSE KEEPING

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 accidents, fire or fire hazards and reduction in production. Good housekeeping will enhance production time.

In promotion of environmental control all waste, rubble, scrap etc., will be disposed of at a registered dumpsite and records will be maintained. Where it is found to be impractical to use a registered dump site or it is not available, the Principal Contractor will ensure that the matter is brought to record with the client or his representative, after which suitable, acceptable alternatives will be sought and applied.

Dross and refuse from metals, and waste matters or by-products whose nature is such that they are poisonous or capable of fermentation, putrefaction or constituting a nuisance shall be treated or disposed of by methods approved of by an inspector.

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.

Facilities
The site establishment plan shall make provision for:

Dining room facilities
The contractor shall make provision for adequate dining room facilities for his employees on site.

Change rooms
The contractor shall make provision for adequate change rooms for his employees on site.

Ablution facilities
The contractor shall make provision for adequate ablution facilities for his employees on site.
These facilities shall be maintained by the contractor.

Smoking Areas
Designated smoking areas shall be established by Department of Public Works.

Drinking Water Facilities
The provision of drinking water facilities shall be negotiated between the Contractor and Department of Public Works.

Equipment Compliance Certificates
Before equipment is brought on site valid certificates of compliance issued by a competent person shall be presented.

The equipment includes but shall not be limited to:
- lifting equipment and lifting tackle
- power driven machinery
- electrical equipment
- testing and monitoring equipment

Barricading
All barricading shall be of the rigid type unless the use of non-rigid barricading has been approved in writing by the Department of Public Works Project Manager. The contractors' barricading standard shall be included in the Health and Safety Plan.

Where more than one contractor is working on a site, the fixed barricading shall be clearly marked with the company's name, site contact person as well as the contact number/s.

Erection of Structures for Logistic Support
Prior to site establishment Department of Public Works shall approve the contractor's site plan.
Department of Public Works shall approve all structures erected for logistical support by the contractor. These structures include fences, workshops, tool sheds, offices, ablution facilities, etc.

Salvage Yard Management
Depending on the site-specific arrangements and procedures, Department of Public Works may provide the salvage yard and the resources to manage it.

The salvage yard management shall conform to safety, health and environmental requirements. The contractors are required to move the equipment from the place of work to the salvage yard.

Fall Arrest and Prevention Equipment
Approved fall prevention equipment shall be used at heights of less than 2.0 metres. Above heights of 2.0 metres fall prevention equipment shall include fall arrest equipment. Users of fall arrest equipment shall, amongst other things be trained in what an appropriate load bearing point is for connecting fall prevention equipment. Any deviation from this requirement shall be negotiated and agreed with Department of Public Works in writing.

Hazardous Chemical Substances Waste Removal
Department of Public Works shall provide a facility to collect all hazardous chemical waste material.

The contractor shall provide adequately marked and sealable containers to transport
The hazardous chemical waste from the source to the approved Department of Public Works disposal point.

Personal Protective Equipment (PPE)
Personal protective equipment issued shall be specific to the risks associated with the work to be performed and specific to conditions on site and shall comply with South African National Standards (SANS) or similar.

SI 20 LOCKOUT SYSTEMS

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 lockout 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.

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:

- List of appointments
- List of record keeping responsibilities
- Inspection checklist

Contractor Risk Assessment Process
The risk assessment process shall include:

- an evaluation of the method of the work to be conducted
- the method statement on the procedure to be followed in performing the task shall be developed
- the risk assessment will also include activities like:
    - Transportation of passengers and goods to and from site
    - Site establishment
    - Physical and mental capabilities of employees
    - Others as may be specified.
    - the hazards as listed in the paragraph – Site Specific Health and Safety Hazards
- a review plan for risk assessments shall provide for:
    - the quarterly review of all applicable risk assessments
    - the review of an assessment if there is reason to believe that the previous assessment is no longer valid, or there has been a change in a process, work methods, equipment or procedures and working conditions

Risk assessment/s to be reviewed if the outcome of incident investigations and audits etc. requires such action.

A pre-task risk assessment shall be conducted in writing on every task and be facilitated by the team leader. All risk assessments and pre-task risk assessments shall be filed and be available on site.

Risk Profile
All contractors shall submit a risk profile of the work to be conducted with their Health and Safety Plan.

Risk Based Inspection Program
The inspection programme shall be risk based. The inspection plan shall form part of the Health and Safety Plan.

IMPORTANT CONTACT DETAILS

(FOR HEALTH & SAFETY ASPECTS ONLY)

The contractor is to add all the important contact information about essentials services, support and assistance.

	SERVICE	NUMBER	CONTACT PERSON
	Hospital		
	Ambulance		
	Water		
	Electricity		
	Police		
	Fire Brigade		
	Engineer		

ADD OTHER IMPORTANT HEALTH & SAFETY CONTACT DETAILS AS MAY BE FOUND NECESSARY.

SECTION 37(2) AGREEMENTS

CONCLUDED BETWEEN

DEPARTMENT OF PUBLIC WORKS
(Hereinafter referred to as Department of Public Works)

AND

……
(Name of contractor/supplier/Agent/)

I, ……..…….. *(name*)

representing ……..... do hereby acknowledge

that ……... is an employer in his/her own right, with duties as prescribed in the Occupational Health and Safety Act No. 85 of 1993 ("the Act"), as amended, and agree to ensure that all work will be performed and/or machinery or plant used in accordance with the provisions of the Act.

I undertake that …… [*insert name of contractor/supplier*] shall strictly adhere to, and ensure that his/her employees adhere to, the provisions of the Occupational Health and Safety Act, 1993 (Act 85 of 1993).

I have been provided with SHE specifications for project/service ……..……

[*insert brief details of project/service, for example, name, contract/project number*]

…….and will comply with the requirements set out in these.

I accept and agree that the SHE specifications constitute arrangements and procedures between

…….. [*Insert name of contractor/supplier/Agent* **Safety Manager/Safety Officer**] and Department of Public Works, which will ensure compliance

by ……. [*Insert name of contractor/supplier*] with the provisions of the Act, as contemplated in section 37(2) of the Act.

This agreement constitutes the sole agreement between the parties, and no variation, modification, or waiver of any of the provisions of this agreement or consent to any departure from these shall, in any manner, be of any force or effect, unless confirmed in writing and signed by both parties, and such variation, modification, waiver, or consent shall be effective only in the specific instance and for the specific purpose and to the extent for which it was made or given.

This agreement is signed on behalf of the parties, each signatory to this warranting that he/she has the requisite authority to do so.

Signed this ……..…….. day of ……..……..……..... at

……..……. (*Place*)

(*Full name*)…… (*Signature*) ……on

behalf of …….. **(Supplier/contractor/Agent)**
Contractor Responsible Manager (*responsible for signing the Department of Public Works' contract on behalf of the contractor*)

Witnesses

……

……..……

Signed this …… day of ……...……

at ……..……..…… (*Place*)

(*Full name*…….. (*Signature*)……on

Behalf of **Department of Public Works.**
(Contracts and/or Project Manager or Department of Public Works representative)

Witnesses

……

……..……

PROJECT: **…….**

(full name AND site address of project)
(and full or proper description of project)

WCS NO: **……..**

SUPERVISION BY THE DEPARTMENT OF PUBLIC WORKS:

Mr /Ms/Me **-** **CONSTRUCTION PROJECT MANAGER**
(add full details of the project manager)

……..……..

Mr /Ms/Me **-** **CONSTRUCTION MANAGER**
(add full details)

……..……..

Mr /Ms/Me **-** **AGENT:**
(full particulars of agent)

……..……..

SUPERVISION BY THE PRINCIPAL CONTRACTOR:

PRINCIPAL CONTRACTOR: **……**
(full particulars of principle contractor / contractor)

Mr /Ms/Me **-** **CONSTRUCTION HEALTH & SAFETY OFFICER**
(add full details and contact of this officer)

……..……..

Mr /Ms/Me **-** **CONSTRUCTION HEALTH & SAFETY MANAGER**
(add full details of this officer)

……..……..

Mr /Ms/Me **-** **CONSTRUCTION HEALTH & SAFETY AGENT**
(add full details of this officer)

……..……..

Mr /Ms/Me **-** **CONSTRUCTION MANAGER**
(add full details of the head of the project)

……..……..

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?	

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?	

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?	

20.4 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
SN 02 TERMINOLOGY AND DEFINITIONS
SN 03 APPLICABLE LABOUR LAWS
SN 04 EMPLOYMENT OF UNSKILLED AND SEMI-SKILLED WORKERS IN LABOUR INTENSIVE WORKS
SN 05 TRAINING OF EPWP WORKERS
SN 06 CONTRACTUAL OBLIGATIONS IN RELATION TO LABOUR
SN 07 SETTING OF RATE OF PAY
SN 08 GENERIC LABOUR-INTENSIVE SPECIFICATION

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)..

The Contractor shall be required to comply with the Occupational Health and Safety Act 85 of 1993, Construction Regulations 2014 and related regulations. Non-compliance with these regulations, in any way whatsoever, will be adequate reason for suspending the Works.

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 an 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.**

EPWP's 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 be 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.

Three types of training are applicable, namely

- Life skills;
- On the job training;
- Technical Skills training.

Training will be implemented by training instructors accredited by DOL and/or CETA:

- EPWP workers shall be deployed on projects in the vicinity of their homes. The same arrangements as for other workers regarding accommodation, subsistence and travel shall be applicable to EPWP workers.

(a) 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.

(b) This training should take place as close to the project site as practically possible.

(c) The contractor shall be responsible for scheduling the training of workers and shall take all reasonable steps to ensure that each beneficiary is provided with the required life skills and technical training.

(d) The contractor shall do nothing to dissuade targeted labour from participating in the above-mentioned training programmes.

(e) An allowance equal to 100% of the task rate or daily rate shall be paid by the contractor to workers who attend formal training, in terms of (d) above.

(f) Proof of compliance with the requirements of (a) to (e) must be provided by the Contractor to the Employer prior to submission of the final payment certificate.

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.

Implementation of labour-intensive practices under the Expanded Public Works Programme (EPWP) is required to a value of not less than 10% of the tendered contract amount for wages paid to local labour.

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.

The employer should make provision to appoint temporary staff whilst the EPWP learners are busy with life skills and technical training.

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.

SN 08.01 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) cleaning of storm water drainage
c) cleaning of roads and sidewalks
d) clearing of fence routes
e) cleaning and site keeping
f) cleaning of buildings

SN 08.02 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.

SN 08.03 Hand excavatable material

Hand excavatable 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:

i) A boulder, a cobble and gravel is material with a particle size greater than 200mm, between 60 and 200mm.

ii) A dynamic cone penetrometer is an instrument used to measure the in-situ 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.

SN 08.04 Trench excavation

All hand excavatable material in trenches having a depth of less than 1,5 metres shall be excavated by hand.

SN 08.05 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.

SN 08.06 Excavation

All hand excavatable material including topsoil classified as hand excavatable 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.

SN 08.07 Clearing and grubbing

Grass and small bushes shall be cleared by hand.

SN 08.08 Shaping

All shaping shall be undertaken by hand.

SN 08.09 Loading

All loading shall be done by hand, regardless of the method of haulage.

SN 08.10 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.

SN 08.11 Offloading

All material, however transported, is to be off- loaded by hand, unless tipper-trucks are utilised for haulage

SN 08.12 Spreading

All material shall be spread by hand.

SN 08.13 Compaction

Small areas may be compacted by hand provided that the specified compaction is achieved.

SN 08.14 Grassing

All grassing shall be undertaking by sprigging, sodding, or seeding by hand.

SN 08.15 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.

SN 08.16 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.

SN 08.17 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

SN 08.18 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

SN 08.19 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.

SN 08.20 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

SN 08.21 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.

SN 08.22 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).

SN 08.23 Bill of quantities

Labour-intensive works is highlighted in the bills of quantities for the payment items relating to labour-intensive works **(LI)**.

SN 09 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.

SN 10 MEASUREMENTS AND PAYMENT

The number of EPWP workers specified for this contract that will receive orientation and life skills development training and technical training are as follow:

- Skills Development Training: **As specified in the Bill of Quantities**
- Technical Training: **As specified in the Bill of Quantities**

SN 10.01 PAYMENT FOR EMPLOYMENT AND TRAINING OF EPWP WORKERS

(TARGET: **AS SPECIFIED IN THE BILL OF QUANTITIES**)

SN 10.01.01 Orientation and Life Skills development training for EPWP workers for an average of 10 days per EPWP worker……..……..……Unit: PC Sum

SN 10.01.02 Technical skills training for EPWP workers for an average of 20 days per EPWP worker……..……..……..……..……..Unit: PC Sum

SN 10.01.03 Profit and attendance for administration of items 1 and 2 above…….…… Unit: %

SN 10.02 PAYMENT FOR TRAVELING OF EPWP WORKERS

SN 10.02.01 Travelling (based on return trip/EPWP worker) …….……..….Unit: worker/ day

The unit of measurement shall be the number of EPWP workers transported from the nearest local community to the workplace and back on a daily basis. The tendered shall allow for the cost of each worker to be able to safely reach the work place and travel back each day and shall be measured as a number for each worker per day.

SN 10.03 PENALTY FOR NOT ACHIEVING THE LOCAL LABOUR TARGET (LLT)

Penalty for not achieving the Local Labour Target (LLT) …….……...…….Unit: %

The unit of measurement shall be the percentage (%) difference between the contracted LLT percentage (%) and the actual LLT percentage (%) achieved in the performance of the contract.

ADDITIONAL SPECIFICATION

SS SITE SPECIFIC INVENTORY

CONTENTS

SS 01 SCOPE
SS 02 SITE LOCALITY INFORMATION
SS 03 DESIGN STANDARDS AND DEFINITIONS
SS 04 LOCATION OF PORTS OF ENTRY
SS 05 SCOPE DEFINITION
SS 06 SITE SPECIFIC INFORMATION

SS 01 SCOPE

This Additional Specification (**SS: Site Specific Inventory**) covers the inventory of the Alexander Bay, Vioolsdrift and Onseepkans 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, preventative, corrective and breakdown maintenance performance as well as operations of water and wastewater works.

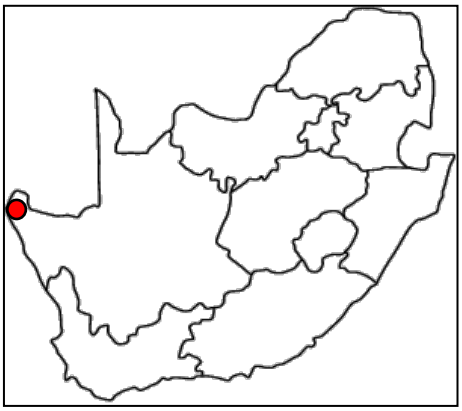
Additional Specification SS: Site Specific Inventory, should be read in conjunction with all other technical, particular and additional specifications applicable to this contract.

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 ***Alexander Bay, Vioolsdrift and Onseepkans*** 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 ALEXANDER BAY PORT OF ENTRY



Alexander Bay Port of Entry is situated on the Northern Cape / Namibia border. The total size of the buildings on Alexander Bay Port of Entry is 678m^2 covering a site area of ±23 200m^2. The Port of Entry houses approximately 8 permanent personnel (43 officials), and services about 189 visitors per day on average. The Port of Entry has ESKOM electricity supplied from Alexcor with a 75kVA standby generator to support the Administration building and essential services. Water is supplied from Alexcor and filtered through a water filter system on site to a bulk tank main supply, and sewer is handled by septic tank systems.

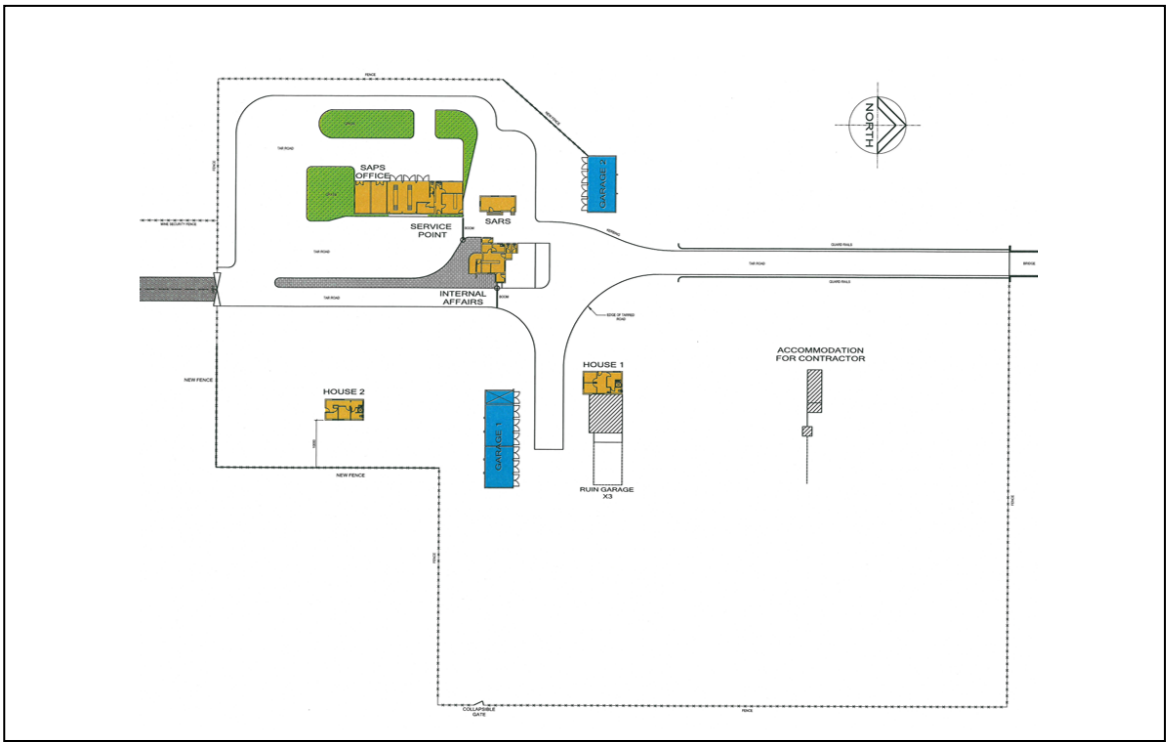
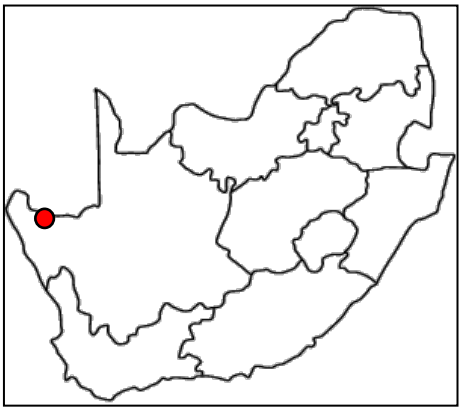


Figure 2.1: Alexander Bay Port of Entry: Site Layout

The contract at the Alexander Bay Port of Entry comprises of maintenance and servicing work as specified in **PG-01.1 (EC) Scope of Works**.

SS 02.02 VIOOLSDRIFT PORT OF ENTRY



Vioolsdrift Port of Entry is situated on the Northern Cape / Namibia border. The total size of the buildings on Vioolsdrift Port of Entry is 11,007m^2 covering a site area of ±172 500m^2. The Port of Entry houses approximately 172 permanent personnel, and services about 680 visitors per day on average. The Port of Entry has ESKOM electricity with a 165kVA standby generator to support the Administration building and essential services. Water is supplied from a water purification plant extracting river water on the premises, and sewer is handled by an anaerobic septic tank system, reed beds, maturation ponds and sludge drying beds.

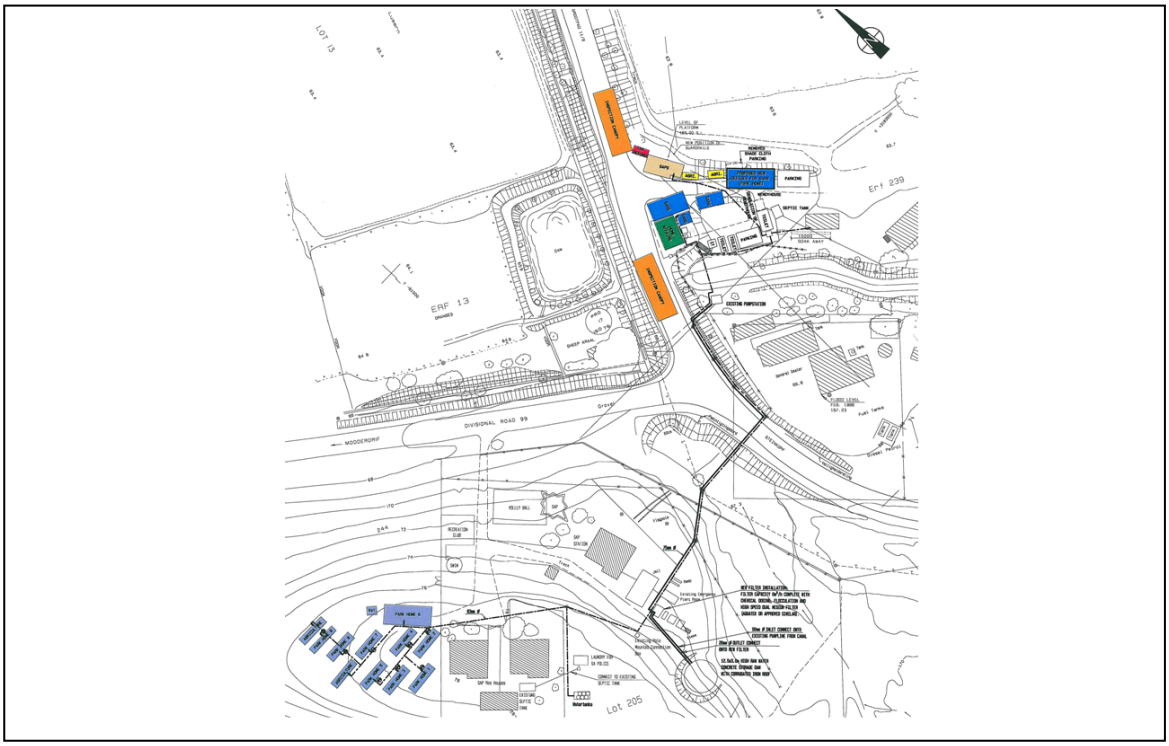
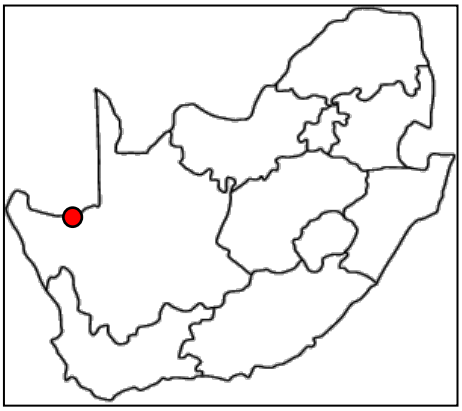


Figure 2.2: Vioolsdrift Port of Entry: Site Layout

The contract at the Vioolsdrift Port of Entry comprises of maintenance and servicing work as specified in **PG-01.1 (EC) Scope of Works**.

SS 02.03 ONSEEPKANS PORT OF ENTRY

Onseepkans Port of Entry is situated on the Northern Cape / Namibia border. The total size of the buildings on Onseepkans Port of Entry is 255m^2 covering a site area of ±5 600m^2. The Port of Entry services about 25 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 river sump, and sewer is handled by septic tank systems.



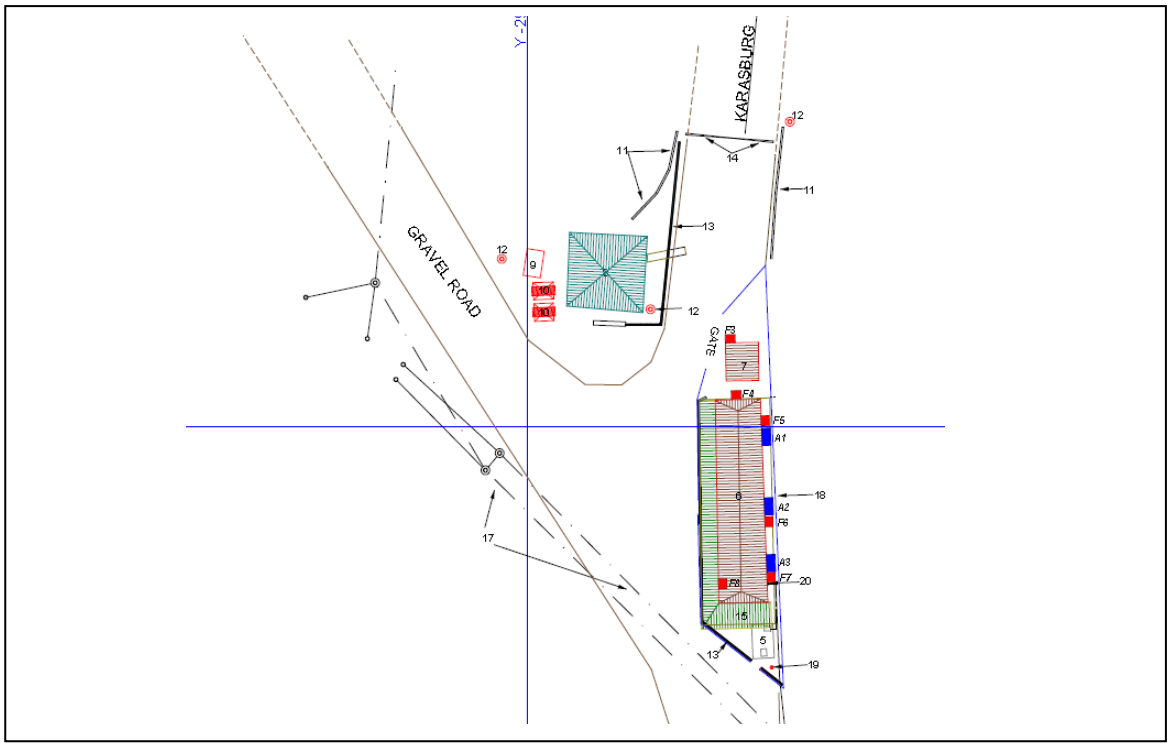


Figure 2.3: Onseepkans Port of Entry: Site Layout

The contract at the Onseepkans 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 0400	National Building Regulations	
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 (2nd edition 2010)	
EPWP	Expanded Public Works Programme	
Call Centre	National 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 LOCATION OF PORTS OF ENTRY

The Alexander Bay, Vioolsdrift and Onseepkans Ports of Entry included in this contract are located at the positions indicate below:

- Alexander Bay Port of Entry is located on the Northern Cape / Namibia border approximately 11km north of Alexander Bay
  (GPS - S 28° 34.10' E 16° 30.36')
- Vioolsdrift Port of Entry is located on the Northern Cape / Namibia border approximately 67km north of Steinkopf in the Northern Cape Province
  (GPS - S 28° 46.10' E 17° 37.48')
- Onseepkans Port of Entry is located on the Northern Cape / Namibia border approximately 49km north of Pofadder
  (GPS - S 28° 44.38' E 19° 18.23')

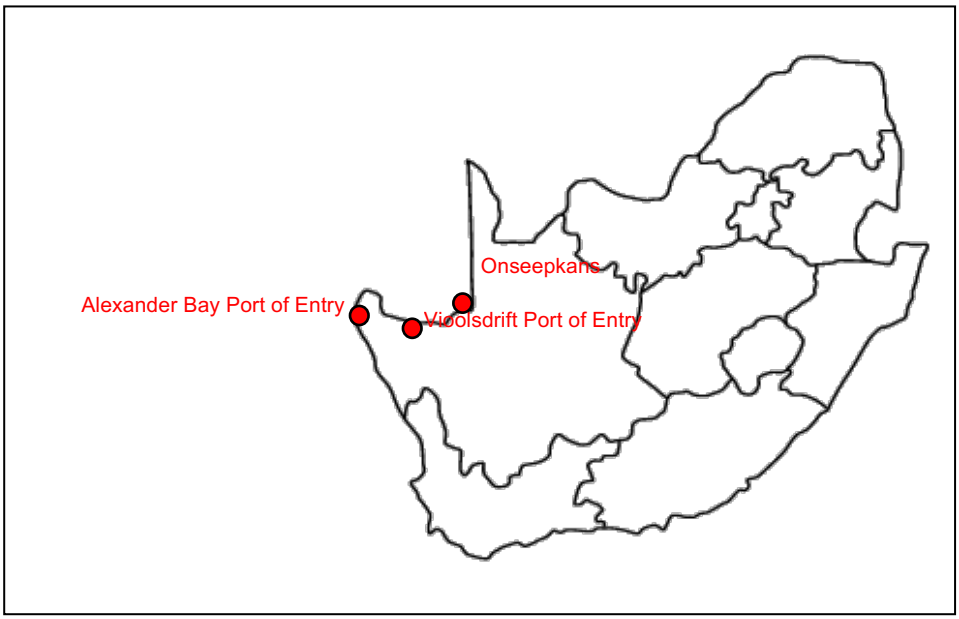


Figure 5.1: Location Alexander Bay, Vioolsdrift and Onseepkans Ports of Entry

SS 05 SCOPE DEFINITION

The description of the works given below 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 06 SITE SPECIFIC INFORMATION

	VIOOLSDRIFT	ALEXANDER BAY	ONSEEPKANS
BUILDING	9345.51m² Residential Buildings	416m² Residential Buildings	Residential Buildings 64.89m²
	4528m² Administration Buildings	992m² Administration Buildings	Operational Buildings 141.14m²
	16152m²Site Area		
STRUCTURAL & BUILDING	633 Cylinder Locks	87 Door Locks	30 Door Locks
	566 Mortice Locks	72 Blinds	25 Vertical Blinds
	395 Security Door Locks		
	609 Blinds		
SANITARY & BRASSWARE	8 Stainless Steel Hand Dryer	4 Stainless Steel Hand Dryer	2 Hand Dryers
	12 Stainless Steel She Bins	5 Stainless Steel She Bins	1 She Bin
	12 Stainless Steel Paper Towel Dispenser	4 Stainless Steel Paper Towel Dispenser	2 Paper Towel Dispensers
	12 Stainless Steel Wall Mounted Bins	4 Stainless Steel Wall Mounted Bins	2 Soap Dispensers
	12 Hand Sanitisers	10 Stainless Steel Hand Sanitisers	
	12 Stainless Steel Soap Dispensers	5 Stainless Steel Soap Dispensers	
PLUMBING & DRAINAGE	225 Sink Mixers	179 Taps and Valves	32 Taps and Valves
	2782 Taps and Valves	21 WC Pans	3 WC Pans
	262 WC Pans	21 Cisterns	3 Cisterns
	262 Cisterns	21 Toilet Seats	3 Toilet Seats
	262 Seats	2 Urinals and Flush Masters	3 Flush Mechanism
	10 Urinals and Flush Masters	35 Hand Wash Basins	5 Hand Wash Basins and Sinks
	260 Hand Wash Basins	15 Showers	2 Geysers
	35 Bath	19 Geysers	1 Bath
	207 Showers	11 Reverse Osmosis Systems	
	79 Single Quarters Geysers		
	34 Married Quarters Geysers		
	196 Geysers		
ELECTRICAL	702 Single Quarters Light Switches	109 Light Switches	24 Light Switches
	543 Married Quarters Light Switches		
	68 POE Light Switches		
	1059 Single Quarters Wall Sockets	152 Wall Sockets	46 Wall Sockets
	664 Married Quarters Wall Sockets		

ELECTRICAL	440 POE Wall Sockets		
	1174 Single Quarters Light Fittings	169 Light Fittings	26 Light Fittings
	547 Married Quarters Light Fittings		
	258 POE Light Fittings		
	11 Insect Electrocutors	21 Small Distribution Boards	5 Small Distribution Boards
	171 Stoves	1 Big Distribution Board	3 Big Distribution Boards
	35 Defy Stoves	105 Circuit Breakers	34 Circuit Breakers
	4 Generators	60 Isolators	14 Isolators
	20 Kiosks	27 Neutral Poles	4 Neutral Poles
	3 Transformers	18 Earth Leakages	6 Earth Leakages
	111 63AMP Circuit Breakers	15 Insect Electrocutors	2 Insect Electrocutors
	94 60AMP Circuit Breakers	1 High mast Lights	
	73 40AMP Circuit Breakers	9 Security Lights	4 Street Lights
	1347 10-20AMP Circuit Breakers	75kVA Generator	85kVA Generator
	265 Earth Leakages	2 Boom gates	6 Boom Gates
	627 Neutral Poles	9 Domestic Stoves	
	265 Single Quarters Isolators		
	104 Married Quarters Isolators		
	1347 Small Distribution Boards		
	2 High Mast Lights		
	15 Street Lights Single Quarters		
	14 Street Lights Married Quarters		
	375kVA Generator Ops		
	3 x 15kVA Generator Sewerworks		
	1 x 15kVA Generator Waterworks		
	113 Solar Panels		
FENCING & CLEANING EQUIPMENT	2448 m Fence	1153 m Fence	200m Perimeter Fence Consisting of 1.2m, 1.8m and 3m Fence
	172000m²Site Keeping Area	23200m²Site Keeping Area	1275m²Area to be Cleaned
ROADS, PARKING AREAS & STORMWATER	7800 m² Roads	3200 m² Roads	5 Carports
	4 Stormwater		
BULK WATER SUPPLY	42 Water Meters	1 Bulk Steel Pressed Tanks	1 Stainless Steel Bulk Tank
	4 Pressed Steel Tanks	2 Motors/ Pumps	
	33 Water Management Systems	2 Filtration/ Chlorination Systems	

SEWER SYSTEM	1 Reed Bed and Evaporation System	2 Septic Tanks	Septic Tank System
	1 Huber System		
HVAC	35 Water Coolers	27 Air Conditioners	9 Split Units
	83 Single Quarters A Air-Conditioners		2 Extractor Fans
	57 Single Quarters B Air-Conditioners		3 Air Curtains
	31 Single Quarters C Air-Conditioners		
	2 Married Quarters Air-Conditioners		
	54 Air conditioners POE		
	176 Single Quarter Fans		
	6 Air Curtains		
FIRE FIGHTING EQUIPMENT	243 4.5 kg DCP Fire Extinguishers	4 CO^2 Fire Extinguishers	2 CO^2 Fire Extinguishers
	13 9 kg DCP Fire Extinguishers	13 9kg DCP Fire Extinguishers	6 DCP 9Kg Fire Extinguishers
	1 Fire Booster Pump (Lister System)	1 Fire Hose Reel	2 4.5 kg DCP Fire Extinguishers
	9 Fire Hydrants and Hosing Cabinet	5 4.5 kg DCP Fire Extinguishers	
	3 Fire Hose Reels		

SQ A GEYSER SERVICE REPORT

LOCATION	MAKE	CAPACITY	PANEL	SYSTEM	DATE INSTALLED	DATE SERVICED	REMARKS
A01	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A02	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A03	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A04	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A05	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A06	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A07	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A08	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A09	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A10	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A11	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A12	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A13	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A14	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A15	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A16	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A17	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A18	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A19	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A20	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A21	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A22	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Aug-18	Aug-19	
A23	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
A24	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A25	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A26	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A27	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A28	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A29	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A30	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A31	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A32	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A33	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
A34	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A35	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A36	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
A37	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
A38	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A39	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A40	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A41	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
A42	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
A43	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT

SQ B GEYSER SERVICE REPORT

LOCATION	MAKE	CAPACITY	PANEL	SYSTEM	DATE INSTALLED	DATE SERVICED	REMARKS
B01	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
B02	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
B03	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
B04	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
B05	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
B06	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
B07	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
B08	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
B09	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
B10	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
B11	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
B12	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
B13	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
B14	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
B15	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
B16	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
B17	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
B18	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
B19	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
B20	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
B21	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
B22	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Aug-18	Aug-19	REPLACE THERMOSTAT AND ELEMENT
B23	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
B24	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
B25	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT

SQ C GEYSER SERVICE REPORT

LOCATION	MAKE	CAPACITY	PANEL	SYSTEM	DATE INSTALLED	DATE SERVICED	REMARKS
C01	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Jun-17	Aug-19	
C02	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
C03	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
C04	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
C05	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
C06	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
C07	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
C08	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
C09	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Jun-17	Aug-19	
C10	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
C11	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT

MQ GEYSER SERVICE REPORT

LOCATION	MAKE	CAPACITY	PANEL		DATE INSTALLED	DATE SERVICED	REMARKS
MQ HOUSE 1	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07		TO BE REPLACED - TANK DAMAGED
MQ HOUSE 2	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
MQ HOUSE 3	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
MQ HOUSE 4	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
MQ HOUSE 5	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
MQ HOUSE 6	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
MQ HOUSE 7	KWIKOT	200 LITER	VACUUM TUBE	DIRECT	Aug-19		TANK WAS DAMAGED - REPLACED
MQ HOUSE 8	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
MQ HOUSE 9	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
MQ HOUSE 10	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
MQ HOUSE 11	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
MQ HOUSE 12	KWIKOT	200 LITER	VACUUM TUBE	DIRECT	Aug-19		TANK WAS DAMAGED - REPLACED
MQ HOUSE 13	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 14	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 15	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 16	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 17	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 18	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 19	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 20	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 21	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 22	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 23	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
MQ HOUSE 24	KWIKOT	200 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Jun-17	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 25	KWIKOT	200 LITER	VACUUM TUBE	DIRECT	Aug-19		TANK WAS DAMAGED - REPLACED
MQ HOUSE 26	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 27	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 28	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 29	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT
MQ HOUSE 30	KWIKOT	200 LITER	VACUUM TUBE	DIRECT	Aug-19		TANK WAS DAMAGED - REPLACED
MQ HOUSE 31	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
MQ HOUSE 32	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
MQ HOUSE 33	GIORDANO	178 LITER	FLAT PLATE GLYCOL	IN-DIRECT	Dec-07	Aug-19	REPLACE THERMOSTAT AND ELEMENT
MQ HOUSE 34	KWIKOT	200 LITER	VACUUM TUBE	DIRECT	Aug-19		TANK WAS DAMAGED - REPLACED

ALEXANDERBAAI POE AIRCONS

LOCATION	MAKE	INDOOR MODEL	INDOOR SERIAL	DATE INSTALLED	DATE SERVICED
SAPS OFFICE ROOM 11	DUNHAMM BUSH	FG 30 HN	A13585065101W00090		Aug-19
IT. ROOM NO 1	DUNHAMM BUSH	DT 242 H	2311603W00020		Aug-19
IT. ROOM NO 2	DUNHAMM BUSH	DT 242 H	2311603W00143		Aug-19
SAPS OFFICE ROOM 01	DUNHAMM BUSH	FG 12 HN	A09185065102W00306		Aug-19
SAPS OFFICE ROOM 02	DUNHAMM BUSH	FG 30 HN	A0915065102W00323		Aug-19
SAPS OFFICE ROOM 06	DUNHAMM BUSH	FG 30 HN	A13585065101W00083		Aug-19
SAPS OFFICE ROOM 08	DUNHAMM BUSH	FG 18 HN	A02485109301W00025		Aug-19
SARS OFFICE NO 1	DUNHAMM BUSH	HP 12 MP	N/A		Aug-19
SARS OFFICE NO2	DUNHAMM BUSH	HP 18 MP	N/A		Aug-19
SARS PARKHOUME 1 A/C 1	DUNHAMM BUSH	HP 12 MF	N/A		Aug-19
SARS PARKHOUME 1 A/C2	DUNHAMM BUSH	HP 12 MF	N/A		Aug-19
SARS PARKHOUME 1 A/C3	DUNHAMM BUSH	HP 12 MF	N/A		Aug-19
SARS PARKHOUME 2 A/C1	TCL	TAC-12CHSAN/KCI	11322NG4080G52400031	Sep-16	Aug-19
SARS PARKHOUME 2 A/C2	TCL	TAC-12CHSAN/KCI	11322NG4080G52400089	Sep-16	Aug-19
IMS OFFICE	DUNHAMM BUSH	DT 182 H	2311601W00377		Aug-19
IMS OFFICE	DUNHAMM BUSH	FG 18 H	3346905W00053		Aug-19
IMS OFFICE	DUNHAMM BUSH	FG 24 H	3346904W00042		Aug-19
IMS PARKHOME 1	ALLIANCE				Aug-19
IMS PARKHOME 2	ALLIANCE				Aug-19
IMS PARKHOME 3	ALLIANCE				Aug-19
HOUSE NO: 1	DUNHAMM BUSH	FG 30 HN	A13585065101W00030		Aug-19
HOUSE NO: 2 A/C1	DUNHAMM BUSH	FG 18 HN	A2485109301W00055		Aug-19
HOUSE NO: 2 A/C2	DUNHAMM BUSH	FG 12 HN	A09185065102W00351		Aug-19
HOUSE NO: 2 A/C3	DUNHAMM BUSH	FG 12 HN	A09185065102W00342		Aug-19
HOUSE NO: 3 A/C1	DUNHAMM BUSH	FG 12 HN	A09185065102W00344		Aug-19
HOUSE NO: 3 A/C2	DUNHAMM BUSH	FG 18 HN	A02485109301W00053		Aug-19
BOARD ROOM	TCL	TAC-18CHSAN/KCI	11322NG4060G52400040	Sep-16	Aug-19

VIOOLSDRIFT POE AIRCONS

LOCATION	MAKE	INDOOR MODEL	INDOOR SERIAL	OUTDOOR MODEL	OUTDOOR SERIAL	DATE INSTALLED	DATE SERVICED
GATE HOUSE NAM	DUNHAMM BUSH	CS 704 M	D202075220313522160029	HP 224 C	D2020617111341315O009		Aug-19
IMMAGRATION	TCL	MBQ 8-P(EN)TCL	Q60010007000GT9230011	TCC-48HRSA	Q50066007700G2020007		Aug-19
ARRIVALS A/C1	DUNHAMM BUSH		D2000794080115415120010		D2000784802154161600 22		Aug-19
ARRIVALS A/C2	DUNHAMM BUSH		D2000794001154151200 50		D2000794802154161600 16		Aug-19
IT ROOM A/C 1	TCL	TAC 18CHSA/XA51I	11438NJ1830J21800018	TAC 18CHSA/XA51I	11876WJ1750J22000035	Aug-19	Aug-19
IT ROOM A/C 2	TCL	TAC 18CHSA/XA51I	11336NJ2280J31800057	TAC 18CHSA/XA51I	11161WJ2280J32100096	Aug-19	Aug-19
SAPS HR &REC A/C1	LG	MT 12 AM	804KAY00199	MT 12 AH	N/A		Aug-19
SAPS HR & REC A/C2	LG	MT 12 AH	804KARW00014	MT 12 AH	N/A		Aug-19
COMMANDERS OFFICE	LG	UTWH 186 ELFC	804KAXV00490	UTWH 186 ELFC	N/A		Aug-19
DEP HEALTH OFFICE	LG	UT 18 NEC	805KADT00034	UT 18 NEC	N/A		Aug-19
GATE HOUSE RSA	TCL	TCA 24 CRH/UI	324024690000B2	TCA 24 CRH/UI	N/A		Aug-19
SCANER SEARCH INBOUND	LG	UT 15 NEC	805KANY00321	UT 18 NEC	N/A		Aug-19
ROOM 003 A	LG	UT 18 NEC	806KAJPQ0065	UT 18 NEC	N/A		Aug-19
ROOM 004	LG	ATNH 186 ELFC	809KAJP050016	ATNH 186 ELFC	808KAKM00601		Aug-19
ROOM 005	LG	ATNH 186 ELFC	801KAPJ006596	ATNH 186 ELFC	802KALN051100		Aug-19
ROOM 007	LG	ATNH 186 ELFC	805KAAE00232	ATNH 186 ELFC	805KAXY000113		Aug-19
ROOM 009	LG	UT 18 NEC	805KAED00012	UT 18 NEC	N/A		Aug-19
ROOM 012 A	LG	ATNH 186 ELFC	805KAJP00020	ATNH 186 ELFC	N/A		Aug-19
ROOM 017	LG	ATNH 186 ELFC	804KASL00478	ATNH 186 ELFC	N/A		Aug-19
ROOM 020	TCL	TCC 18 HRA	Q30062114500008700 20	TCC 18 HRA	Q50033009200 9200001		Aug-19
ROOM 021	TCL	TCC-48HRSA	Q40066005500F8060031	TCC-48HRSA	Q50066006600F9060014		Aug-19
ROOM 023	LG	MT 12 AH	806CAZT0054	MT 12 AH	N/A		Aug-19
ROOM 024	LG	ATNH 186 ELFC	805KAED00036	ATNH 186 ELFC	N/A		Aug-19
ROOM 028	LG	ATNH 186 ELFC	805KAHG00241	ATNH 186 ELFC	N/A		Aug-19
ROOM 031	LG	ATNH 186 ELFC	805KAGS00031	ATNH 186 ELFC	N/A		Aug-19
R00M 032	LG	ATNH 186 ELFC	805KAED00348	ATNH 186 ELFC	N/A		Aug-19
ROOM 033	LG	ATNH24GPLED	804KAYR00306	ATNH24GPLED	N/A		Aug-19
ROOM 036 A/C1	TCL	TCA-48 CHR/UI	3240480001 00C1090021	TCA-48 CHR/UI	N/A		Aug-19
ROOM 036 A/C2	LG	AG 18 HN	B07255052104N00006	AG 18 HN	N/A		Aug-19
R0OM 042	LG	UTWH 186 ELFC	805KAED00228	UTWH 186 ELFC	N/A		Aug-19
R0OM 043	LG	UTWH 186 ELFC	805KAJP00236	UTWH 186 ELFC	N/A		Aug-19
R0OM 044	LG	UTWH 186 ELFC	805KAMZ00229	UTWH 186 ELFC	N/A		Aug-19
ROOM 048 A/C1	LG	MT 24 AH	803KAUU00046	MT 24 AH	N/A		Aug-19
ROOM 048 A/C2	LG	MT 24 AH	803KAKN00045	MT 24 AH	N/A		Aug-19
ROOM 050	LG	ATNH 186 ELFC	804KAZK00477	ATNH 186 ELFC	N/A		Aug-19
ROOM 051	LG	MT 24 AH	803KAET00069	MT 24 AH	N/A		Aug-19
ROOM 052	LG	S 18 AW	807KAQT40905	S 18 AW	N/A		Aug-19
ROOM 053	LG	MT 24 AH	803KAED00044	MT 24 AH	N/A		Aug-19
ROOM 067	LG	UT 18 NEC	803KAZP00946	UT 18 NEC	N/A		Aug-19
ROOM 071	LG	UT 18 NEC	806KAPZL0065	UT 18 NEC	N/A		Aug-19
ROOM 074	LG	UT 18 NEC	805KALPQ00584	UT 18 NEC	N/A		Aug-19
ROOM 075	LG	UT 18 NEC	805KASL60006	UT 18 NEC	N/A		Aug-19
ROOM 076	LG	S 18 AM	806KAFQ0065	S 18 AM	N/A		Aug-19
ROOM 080A	LG	S 12 AM	901KAUU0086	S 12 AM	811KAQJ00100		Aug-19
ROOM 080	LG	S 12 AM	811KAED0040	S 12 AM	811KAG840079		Aug-19
ROOM 083	LG	UT 18 HN	806KAJP00065	UT 18 HN	N/A		Aug-19
ROOM 086	LG	UT 18 HN	805KAFX00235	UT 18 HN	N/A		Aug-19
ROOM 087	LD	ATN 4-186 ELFC	805KAWO00017	ATN 4-186 ELFC	805KACA00099		Aug-19
ROOM 087	LG	UT 18 HN	804KAJQ000124	UT 18 HN	N/A		Aug-19
ROOM 095	LG	S 12 AM	901KAYR001122	S 12 AM	N/A		Dec-18
ROOM 096	LG	S 12 AM	901KAXV00090	S 12 AM	N/A		Aug-19
ROOM 099	LG	S 12 AM	901KAJP00032	S 12 AM	N/A		Aug-19
ROOM 100	TCL	TAC-12CHSAN/KCI	11391NG3270G51100522	TAC-12CHSAN/KCI	11481WG5360G2298431	Nov-16	Aug-19
ROOM 101	TCL	TAC-12CHSAN/KCI	11391NG3270G41100132	TAC-12CHSAN/KCI	11481NG5360G62114411	Nov-16	Aug-19

VIOOLSDRIFT MQ A/C AND E/C

LOCATION	MAKE	OUTDOOR MODEL	OUTDOOR SERIAL	DATE INSTALLED	DATE CHECKLIST
RECREATION	BREEZ AIR	TBA 550	NO 00059419		Aug-19
MQ HOUSE 1	BREEZ AIR	TBQ 55O	NO 00189598	Aug-17	Aug-19
MQ HOUSE 1	LG	SA 12 AM	801KAXV07474		Aug-19
MQ HOUSE 2	BREEZ AIR	TBQ 55O	NO 00345712	Aug-17	Aug-19
MQ HOUSE 3	BREEZ AIR	TBQ 55O	NO 00345713	Aug-17	Aug-19
MQ HOUSE 4	BREEZ AIR	TBQ 550	NO 00189566		Aug-19
MQ HOUSE 5	BREEZ AIR	TBQ 550	NO 00189583		Aug-19
MQ HOUSE 6	BREEZ AIR	TBQ 550	NO 00189609		Aug-19
MQ HOUSE 7	BREEZ AIR	TBQ 550	NO 00189612		Aug-19
MQ HOUSE 8	BREEZ AIR	TBA 550	NO 00059416	Oct-16	Aug-19
MQ HOUSE 8	LG	SA 12 AM	811KAEQ00208		Aug-19
MQ HOUSE 9	BREEZ AIR	TBA 550	NO 00059418	Oct-16	Aug-19
MQ HOUSE 10	BREEZ AIR	TBA 550	NO 00059431	Oct-16	Aug-19
MQ HOUSE 11	BREEZ AIR	TBA 550	NO 00059415	Oct-16	Aug-19
MQ HOUSE 12	BREEZ AIR	TBA 550	NO 00059413	Oct-16	Aug-19
MQ HOUSE 13	BREEZ AIR	TBA 550	NO 00052344	Oct-16	Aug-19
MQ HOUSE 14	BREEZ AIR	TBA 550	NO 00060186	Oct-16	Aug-19
MQ HOUSE 15	BREEZ AIR	TBA 550	NO 00060185	Oct-16	Aug-19
MQ HOUSE 16	BREEZ AIR	TBQ 55O	NO 00189584	Aug-17	Aug-19
MQ HOUSE 17	BREEZ AIR	TBQ 550	NO 00345706		Aug-19
MQ HOUSE 18	BREEZ AIR	TBQ 55O	NO 00189573	Aug-17	Aug-19
MQ HOUSE 19	BREEZ AIR	TBQ 55O	NO 00189565	Aug-17	Aug-19
MQ HOUSE 20	BREEZ AIR	TBQ 550	NO 00345720		Aug-19
MQ HOUSE 21	BREEZ AIR	TBQ 550	NO 00189594	Aug-17	Aug-19
MQ HOUSE 22	BREEZ AIR	TBQ 550	NO 00345723	Aug-17	Aug-19
MQ HOUSE 23	BREEZ AIR	TBQ 55O	NO 00345699	Aug-17	Aug-19
MQ HOUSE 24	BREEZ AIR	TBA 550	NO 00060165	Oct-16	Aug-19
MQ HOUSE 25	BREEZ AIR	TBA 550	NO 00052328	Oct-16	Aug-19
MQ HOUSE 26	BREEZ AIR	TBA 550	NO 00060181	Oct-16	Aug-19
MQ HOUSE 27	BREEZ AIR	TBA 550	NO 00049523	Oct-16	Aug-19
MQ HOUSE 28	BREEZ AIR	TBA 550	NO 00049535	Oct-16	Aug-19
MQ HOUSE 29	BREEZ AIR	TBA 550	NO 00049534	Oct-16	Aug-19
MQ HOUSE 30	BREEZ AIR	TBA 550	NO 00052329	Oct-16	Aug-19
MQ HOUSE 31	BREEZ AIR	TBA 550	NO 00052338	Oct-16	Aug-19
MQ HOUSE 32	BREEZ AIR	TBA 550	NO 00095341	Oct-16	Aug-19
MQ HOUSE 33	BREEZ AIR	TBA 550	NO 00052337	Oct-16	Aug-19
MQ HOUSE 34	BREEZ AIR	TBA 550	NO 00095345	Oct-16	Aug-19

VIOOLSDRIFT SQ A AIRCONS

	LOCATION	MAKE	INDOOR MODEL	INDOOR SERIAL	OUTDOOR MODEL	OUTDOOR SERIAL	DATE INSTALLED	DATE SERVICED
1	A0 01	LG	S 18 AW	804KAJP00156	S 18 AW	803KAUU01006		
2	A0 02	LG	S 18 AW	804KALC00168	S 18 AW	803KAWQ1009		Aug-19
3	A0 03	LG	S 18 AW	806KAXV00050	S 18 AW	803KARQ01014		Aug-19
4	A0 04	LG	S 18 AW	804KAPB00160	S 18 AW	803KAQJ01044		Aug-19
5	A0 05	LG	S 18 AW	806KACA00011	S 18 AW	803KAMZ00907		Aug-19
6	A0 06	LG	S 18 AW	N/A	S 18 AW	N/A		Aug-19
7	A0 07	LG	S 18 AW	804KAKN00173	S 18 AW	803KAHG01017		Aug-19
8	A0 08	LG	S 18 AW	804KAUU00174	S 18 AW	803KAQWQ01057		Aug-19
9	A0 09	TCL	TAC-18CHSA/KCSY	11429NH7110H90100089	TAC-18CHSA/KCSYMI	11161WH8190HA0800041	Mar-18	Aug-19
10	A0 10	TCL	TAC-18CHSAN/KCI	11322NG4060G52400015	TAC-18CHSAN/KCI	11201WG4980G52400037	Nov-16	Aug-19
11	A0 11	LG	S 18 AW	805KALC00224	S 18 AW	806KAVH00007		Aug-19
12	A0 12	LG	S 18 AW	805KASL00006	S 18 AW	806KANY00119		Aug-19
13	A0 13	LG	S 18 AW	805KAWQ00209	S 18 AW	806KAKN00069		
14	A0 14	TCL	TAC-18CHSA/KCSY	11434NH8400HA0800062	TAC-18CHSA/KCSYMI	11161WH8190HA0800099	Mar-18	
15	A0 15	LG	S 18 AW	804KADE0075	S 18 AW	803KASJ50400		
16	A0 16	TCL	TAC-18CHSAN/KCI	11322NG4060G52400027	TAC-18CHSAN/KCI	11201WG9550G92300021	Nov-16	
17	A0 17	LG	S 18 AW	804KAYR00330	S 18 AW	803KAMZ01051		Aug-19
18	A0 18	LG	S 18 AW	805KAVH00239	S 18 AW	806KAYR00010		
19	A0 19	TCL	TAC-18CHSA/KCSY	11434NH8400HA0800072	TAC-18CHSA/KCSYMI	11161WH8190HA0800020	Mar-18	
20	A0 20	TCL	TAC-18CHSA/KCSY	11429NH7110H9010097	TAC-18CHSA/KCSYMI	11161WH7950H90100064	Mar-18	
21	A1 01	LG	S 18 AW	805KAXV00138	S 18 AW	805KAAE00048		Aug-19
22	A1 02	LG	S 18 AW	805KABF00141	S 18 AW	806KAXF00050		Aug-19
23	A1 03	LG	S 18 AW	805KAAE00208	S 18 AW	803KAED001052		Aug-19
24	A1 04	LG	S 18 AW	805KAPB00216	S 18 AW	806KAGA00131		Aug-19
25	A1 05	LG	S 18 AW	805KANY00207	S 18 AW	803KAXV01034		
26	A1 06	TCL	TAC-18CHSA/KCSY	11434NH400HA0800030	TAC-18CHSA/KCSYMI	11161WH8190HA0800091	Mar-18	Aug-19
27	A1 07	LG	S 18 AW	805KAQJ00220	S 18 AW	803KAVH01039		Aug-19
28	A1 08	LG	S 18 AW	N/A	S 18 AW	805KAQJ00172		Aug-19
29	A1 09	LG	S 18 AW	804KATM00001	S 18 AW	N/A		
30	A1 10	LG	S 18 AW	N/A	S 18 AW	N/A		
31	A1 11	LG	S 18 AW	805KAVH00215	S 18 AW	806KAJP00028		
32	A1 12	LG	S 18 AW	804KADJ00050	S 18 AW	805KADT00226		Aug-19
33	A1 13	TCL	TAC-18CHSAN/KCI	11322NG4060G52400028	TAC-18CHSAN/KCI	11201WG4980G52400038	Nov-16	Aug-19
34	A1 14	LG	S 18 AW	804KAZT01165	S 18 AW	804KATD0005		Aug-19
35	A1 15	TCL	TAC-18CHSAN/KCI	11322NG4060G52400018	TAC-18CHSAN/KCI	11201WG4980G52400038	Nov-16	
36	A1 16	TCL	TAC-18CHSA/KCSY	11434NH8400HA0800037	TAC-18CHSA/KCSYMI	11161WH8190HA0800088	Mar-18	Aug-19
37	A1 17	TCL	TAC-18CHSAN/KCI	11322NG4050G52400008	TAC-18CHSAN/KCI	11201WG4980G52400043	Nov-16	
38	A1 18	TCL	TAC-18CHSA/KCSY	11434NH400HA0800017	TAC-18CHSA/KCSYMI	11364WH400HC0300006		Aug-19
39	A1 19	LG	S 18 AW	N/A	S 18 AW	N/A		Aug-19
40	A1 20	TCL	TAC-18CHSA/KCSY	11429NH7110H90100099	TAC-18CHSA/KCSYMI	11161WH7950H90100038	Mar-18	
41	A1 21	TCL	TAC-18CHSAN/KCI	11391NG3250G41500040	TAC-18CHSAN/KCI	11201WG4980G52400018	Nov-16	
42	A1 22	LG	S 18 AW	N/A	S 18 AW	805KAGS00151		Aug-19
43	A1 23	TCL	TAC-18CHSAN/KCI	11322NG4060G52400032	TAC-18CHSAN/KCI	11201WG3810G41600049	Nov-16	Aug-19
44	A1 24	TCL	TAC-18CHSAN/KCI	11322NG4060G52400009	TAC-18CHSAN/KCI	11201WG4980G52400029	Nov-16	Aug-19
45	A1 25	TCL	TAC-18CHSAN/KCI		TAC-18CHSAN/KCI	11201WG4980G52400027	Nov-16	Aug-19
46	A1 26	TCL	TAC-18CHSAN/KCI	11429NH7110H90100093	TAC-18CHSAN/KCI	11161WH7950H901000896		Aug-19
47	A1 27	LG	S 18 AW	805KAFX00235	S 18 AW	805KAJP00212		Aug-19
48	A1 28	LG	S 18 AW	805KAYR00242	S 18 AW	805KAWQ00233		Aug-19
49	A1 29	LG	S 18 AW	803KAJP01276	S 18 AW	805KAED00156		
50	A1 30	LG	S 18 AW	N/A	S 18 AW	803KATM01025		
51	A1 31	TCL	TAC-18CHSAN/KCI	11322NG4060G52400005	TAC-18CHSAN/KCI	11201WG4980G52400025	Nov-16	
52	A2 01	TCL	TAC-18CHSAN/KCI	11322NG4060G52400019	TAC-18CHSAN/KCI	11201WG3810G41600033	Nov-16	
53	A2 02	LG	S 18 AW	804KAKZ000333	S 18 AW	803KAMZ201009		Aug-19
54	A2 03	LG	S 18 AW	N/A	S 18 AW	N/A		Aug-19
55	A2 04	LG	S 18 AW	804KADT00002	S 18 AW	803KASL01022		Aug-19
56	A2 05	LG	S 18 AW	804KAJP0026	S 18 AW	803KALC01000		
57	A2 06	LG	S 18 AW	804KAKN00317	S 18 AW	803KALC01024		Aug-19
58	A2 07	LG	S 18 AW	804KAXV00010	S 18 AW	803KABF00915		Aug-19
59	A2 08	LG	S 18 AW	805KADE00136	S 18 AW	803KAXV01058		
60	A2 09	LG	S 18 AW	805KARL000235	S 18 AW	N/A		Aug-19
61	A2 10	LG	S 18 AW	805KAQJ00228	S 18 AW	803KAKN01029		Aug-19
62	A2 11		AG 18 HN	B07255152102N00105	FG 18 HN	A024852104W00062		Aug-19
63	A2 12	LG	S 18 AW	804KAYK00042	S 18 AW	803KAJP01036		Aug-19
64	A2 13	TCL	TAC-18CHSAN/KCI	11322NG4060G52400001	TAC-18CHSAN/KCI	11201WG4980G52400024	Nov-16	Aug-19
65	A2 14	LG	S 18 AW	804KANY00319	S 18 AW	805KAWQ00167		
66	A2 15	LG	S 18 AW	N/A	S 18 AW	803KAZK01021		Aug-19
67	A2 16	LG	S 18 AW	N/A	S 18 AW	805KAFX00325		Aug-19
68	A2 17	LG	S 18 AW	804KAAE00320	S 18 AW	N/A		
69	A2 18	LG	S 18 AW	804KADT00314	S 18 AW	803KAJP01012		Aug-19
70	A2 19	LG	S 18 AW	804KASL00022	S 18 AW	803KAKW01005		
71	A2 20	TCL	TAC-18CHSAN/KCI	11322NG4060G52400011	TAC-18CHSAN/KCI	11201WG4980G52400033	Nov-16	
72	A2 21	TCL	TAC-18CHSA/KCSY	11429NH7110H90100001	TAC-18CHSA/KCSYMI	11161WH7950H90100088	Mar-18	Aug-19
73	A2 22	TCL	TAC-18CHSAN/KCI	11322NG4060G52400050	TAC-18CHSAN/KCI	11201WG4980G52400027	Nov-16	Aug-19
74	A2 23	TCL	TAC-18CHSAN/KCI	11322NG4060G52400002	TAC-18CHSAN/KCI	11201WG4980G52400006	Nov-16	
75	A2 24	LG	S 18 AW	804KAGS00203	S 18 AW	803KAJP01276		Aug-19
76	A2 25	LG	S 18 AW	804KANY00007	S 18 AW	806KAZK00061		
77	A2 26	TCL	TAC-18CHSA/KCSY	11429NH7110H90100093	TAC-18CHSA/KCSYMI	11161WH7950H90100086	Mar-18	
78	A2 27	TCL	TAC-18CHSAN/KCI	11322NG4060G52400007	TAC-18CHSAN/KCI	11201WG4980G52400004	Nov-16	
79	A2 28	LG	S 18 AW	804KAYR00258	S 18 AW	N/A		
80	A2 29	LG	S 18 AW	804KATM00025	S 18 AW	803KASL0059		
81	A2 30	LG	S 18 AW	804KAAE00032	S 18 AW	803KAYA00994		
82	A2 31	TCL	TAC-18CHSAN/KCI	11322NG4060G52400005	TAC-18CHSAN/KCI	11201WG4980G52400039	Nov-16	
83	A2 32	TCL	TAC-18CHSAN/KCI	11322NG4060G52400044	TAC-18CHSAN/KCI	11201WG4980G52400014	Nov-16	Aug-19

VIOOLSDRIFT SQ B AIRCONS

	LOCATION	MAKE	INDOOR MODEL	INDOOR SERIAL	OUTDOOR MODEL	OUTDOOR SERIAL	DATE INSTALLED	DATE SERVICED
1	B0 01	LG	S 18 AW	805KAHG00271	S 18 AW	806KANY00047		Aug-19
2	B0 02	LG	S 18 AW	805KAXV00234	S 18 AW	806KAWQ0025		Aug-19
3	B0 03	TCL	TAC-18CHSAN/KCI	11322NG4060G52400020	TAC-18CHSAN/KCI	11201WG4980G52400031	Nov-16	Aug-19
4	B0 04	TCL	TAC-18CHSAN/KCI	11322NG4060G52400003	TAC-18CHSAN/KCI	11201WG4980G52400030	Nov-16	Aug-19
5	B0 05	TCL	TAC-18CHSAN/KCI	1132NG4060G52400029	TAC-18CHSAN/KCI	11201WG4980G52400042	Nov-16	Aug-19
6	B0 06	TCL	TAC-18CHSAN/KCI	1132NG4060G5240001	TAC-18CHSAN/KCI	11201WG3810G41600047	Nov-16	Aug-19
7	B0 07	LG	S 18 AW	804KAGS00287	S 18 AW	806KADF00125		Aug-19
8	B0 08	TCL	TAC-18CHSAN/KCI	11374NG9450G92500012	TAC-18CHSAN/KCI	11201WG9550G92500020	Nov-16	Aug-19
9	B0 09	TCL	TAC-18CHSAN/KCI	11391NG3250G41600043	TAC-18CHSAN/KCI	11201WG9550G92500008	Nov-16	Aug-19
10	B0 10	TCL	TAC-18CHSAN/KCI	11322NG4060G52400022	TAC-18CHSAN/KCI	11201WG4980G52400041	Nov-16	Aug-19
11	B0 11	TCL	TAC-18CHSAN/KCI	11374NG9450G92500015	TAC-18CHSAN/KCI	11201WG4980G52400032	Nov-16	Aug-19
12	B0 12	TCL	TAC-18CHSAN/KCI		TAC-18CHSAN/KCI	11201WG4980G52400021	Nov-16	Aug-19
13	B0 13	TCL	TAC-18CHSAN/KCI	11322NG4060G52400013	TAC-18CHSAN/KCI	11201WG4980G52400020	Nov-16	Aug-19
14	B0 14	TCL	TAC-18CHSAN/KCI	11322NG4060G52400025	TAC-18CHSAN/KCI	11201WG4980G52400026	Nov-16	Aug-19
15	B1 01	LG	S 18 AW	804KAWY0271	S 18 AW	803KAFX01059		Aug-19
16	B1 02	LG	S 18 AW	804KAKN60269	S 18 AW	803KAFX01038		Aug-19
17	B1 03	TCL	TAC-18CHSAN/KCI	11322NG4060G52400012	TAC-18CHSAN/KCI	11201WG4980G52400022	Nov-16	Aug-19
18	B1 04	LG	S 18 AW	804KATM00049	S 18 AW	N/A		Aug-19
19	B1 05	LG	S 18 AW	804KADT00290	S 18 AW	803KAGS0107		Aug-19
20	B1 06	LG	S 18 AW	804KAPB00256	S 18 AW	803KANQ01273		Aug-19
21	B1 07	LG	S 18 AW	N/A	S 18 AW	806KATM00065		Aug-19
22	B1 08	LG	S 18 AW	804KAHG00041	S 18 AW	803KABF01061		Aug-19
23	B1 09	TCL	TAC-18CHSAN/KCI	11322NG4060G52400048	TAC-18CHSAN/KCI	11201WG4980G52400044	Nov-16	Aug-19
24	B1 10	LG	S 18 AW	804KAQJ00260	S 18 AW	806KAXF00122		Aug-19
25	B1 11	LG	S 18 AW	804KAED00268	S 18 AW	N/A		Aug-19
26	B1 12	LG	S 18 AW	804KAMZ00291	S 18 AW	803KAYRV1018		Aug-19
27	B1 13	TCL	TAC-18CHSAN/KCI	11322NG4060G52400013	TAC-18CHSAN/KCI	11201WG4980G52400020	Nov-16	Aug-19
28	B1 14	LG	S 18 AW	804KAXV00322	S 18 AW	803KAVH01279		Aug-19
29	B1 15	TCL	TAC-18CHSAN/KCI	11322NG4060G52400011	TAC-18CHSAN/KCI	11201WG4980G52400008	Nov-16	Aug-19
30	B1 16	LG	S 18 AW	804KAQJ00044	S 18 AW	803KACA00995		Aug-19
31	B1 17	LG	S 18 AW	804KAMZ00267	S 18 AW	803KATM01049		Aug-19
32	B1 18	LG	S 18 AW	804KAQS00047	S 18 AW	805KAVH00167		Aug-19
33	B1 19	LG	S 18 AW	804KAZX00285	S 18 AW	805KALC00176		Aug-19
34	B1 20	LG	S 18 AW	804KALC00045	S 18 AW	803KAMZ00955		Aug-19
35	B1 21			908KAWG00025		908KAFW00007		Aug-19
36	B2 01	TCL	TAC-18CHSA/KCSYMI		TAC-18CHSA/KCSYMI		Mar-18	Aug-19
37	B2 02	LG	S 18 AW	804KAHG00329	S 18 AW	803KADT00954		Aug-19
38	B2 03	LG	S 18 AW	804KAFX00011	S 18 AW	803KAUU01030		Aug-19
39	B2 04	LG	S 18 AW	804KAJP00012	S 18 AW	803KAPB01040		Aug-19
40	B2 05	TCL	TAC-18CHSAN/KCI	11374NG9450G92500017	TAC-18CHSAN/KCI	11201WG9550G92500026	Nov-16	Aug-19
41	B2 06	LG	S 18 AW	806KAKQ00021	S 18 AW	803KABP01160		Aug-19
42	B2 07	DHAM BUSH	AG 18 HN	B0725515210ZN0008	N/A	N/A		Aug-19
43	B2 08	LG	S 18 AW	804KAPB00040	S 18 AW	803KAUU01050		Aug-19
44	B2 09	LG	S 18 AW	804KAFX00328	S 18 AW	803KANY01271		Aug-19
45	B2 10	TCL	TAC-18CHSAN/KCI	11322NG4060G52400030	TAC-18CHSAN/KCI	11201WG8801G52400016	Nov-16	Aug-19
46	B2 11	LG	S 18 AW	N/A	S 18 AW	803KAWQ00985		Aug-19
47	B2 12	LG	S 18 AW	N/A	S 18 AW	805KATM00153		Aug-19
48	B2 13	LG	S 18 AW	804KAHG0017	S 18 AW	803KARW00966		Aug-19
49	B2 14	LG	S 18 AW	804KAQL00332	S 18 AW	803KAQJ01020		Aug-19
50	B2 15	TCL	TAC-18CHSAN/KCI	11322NG4060G52400039	TAC-18CHSAN/KCI	11201WG4980G52400003	Nov-16	Aug-19
51	B2 16	LG	S 18 AW	806KAFX00003	S 18 AW	N/A		Aug-19
52	B2 17	TCL	TAC-18CHSAN/KCI	11374NG9450G92500004	TAC-18CHSAN/KCI	11201WG4980G52400008	Mar-18	Aug-19
53	B2 18	LG	S 18 AW	804KAED0004	S 18 AW	806KAPB00032		Aug-19
54	B2 19	LG	S 18 AW	804KAUU00318	S 18 AW	803KALC00952		Aug-19
55	B2 20	LG	S 18 AW	804KAZD00482	S 18 AW	803KAPM0461		Aug-19
56	B2 21	LG	S 18 AW	804KAPD00328	S 18 AW	N/A		Aug-19
57	B2 22	TCL	TAC-18CHSA/KCSYMI	11429NG7110H90100008	TAC-18CHSA/KCSYMI	11161WH7950H90100097	Mar-18	Aug-19

VIOOLSDRIFT SQ C AIRCONS

	LOCATION	MAKE	INDOOR MODEL	INDOOR SERIAL	OUTDOOR MODEL	OUTDOOR SERIAL	DATE INSTALLED	DATE SERVICED
1	C0 01	TCL	TAC-18CHSAN/KCI	11322NG4060G52400045	TAC-18CHSAN/KCI	11201WG4980G52400013	Nov-16	Aug-19
2	C0 02	LG	S 18 AW	806KASL00014	S 18 AW	805KABF00234		Aug-19
3	C0 03	LG	S 18 AW	804KATM00169	S 18 AW	805KAQJ00244		Aug-19
4	C0 04	LG	S 18 AW	804KASL0066	S 18 AW	806KAFX00051		Aug-19
5	C0 05	TCL	TAC-18CHSAN/KCI		TAC-18CHSAN/KCI	11201WG4980G52400006	Nov-16	Aug-19
6	C0 06	TCL	TAC-18CHSAN/KCI	11322NG4060G52400002	TAC-18CHSAN/KCI	11201WG4980G52400007	Nov-16	Aug-19
7	C0 07	LG	S 18 AW	805KAZT00047	S 18 AW	806KATD05001		Aug-19
8	C0 08	TCL	TAC-18CHSAN/KCI		TAC-18CHSAN/KCI	11201WG4980G52400009	Nov-16	Aug-19
9	C0 09	LG	S 18 AW	806KALC0064	S 18 AW	803KAMZ01243		Aug-19
10	C0 10	LG	S 18 AW	804KAYR00162	S 18 AW	806KAYR00130		Aug-19
11	C1 01	LG	S 18 AW	804KADT0070	S 18 AW	803KAQJ00148		Aug-19
12	C1 02	LG	S 18 AW	806KASL00062	S 18 AW	806KARW00126		Aug-19
13	C1 03	LG	S 18 AW	806KAED00044	S 18 AW	806KASL00062		Aug-19
14	C1 04	LG	S 18 AW	804KANY00175	S 18 AW	803KAUU01270		Aug-19
15	C1 05	LG	S 18 AW	806KAPZ0060	S 18 AW	805KAZJ0681		Aug-19
16	C1 06	LG	S 18 AW	804KAMZ00171	S 18 AW	803KANY01031		Aug-19
17	C1 07	LG	S 18 AW	806KAQJ00012	S 18 AW	806KAGS0063		Aug-19
18	C1 08	LG	S 18 AW	806KAZK00013	S 18 AW	N/A		Aug-19
19	C1 09	LG	S 18 AW	804KAVH00159	S 18 AW	N/A		Aug-19
20	C1 10	LG	S 18 AW	806KAFJ060500	S 18 AW	N/A		Aug-19
21	C1 11	LG	S 18 AW	803KAED00132	S 18 AW	806KAHG00009		Aug-19
22	C2 01	LG	S 18 AW	804KARW00138	S 18 AW	805KASL00150		Aug-19
23	C2 02	LG	S 18 AW	805KACA00245	S 18 AW	803KACA00971		Aug-19
24	C2 03	LG	S 18 AW	804KACA00163	S 18 AW	N/A		Aug-19
25	C2 04	LG	S 18 AW	804KAED00052	S 18 AW	805KASL0022		Aug-19
26	C2 05	LG	S 18 AW	804KALC00335	S 18 AW	805KAFX00211		Aug-19
27	C2 06	LG	S 18 AW	805KAQJ00004	S 18 AW	803KAMZ01027		Aug-19
28	C2 07	LG	S 18 AW	805KAUU00134	S 18 AW	803KDTO01050		Aug-19
29	C2 08	LG	S 18 AW	804KAQJ00164	S 18 AW	803KAGS01025		Aug-19
30	C2 09	LG	S 18 AW	806KALL00016	S 18 AW	803KAJQ00996		Aug-19
31	C2 10	LG	S 18 AW	N/A	S 18 AW	803KAVH01063		Aug-19

MARRIED QUARTERS QTY															
	NO. ROOMS	TYPE	2 X 2F FLOUR	40W SIRCULAR	2 X 4FT FLOUR	BULKHEAD	BEKA TYPE J	BEKA TYPE C	TRAP	400W HPS	STREET LIGHT	SWITCH	PLUGS	ISOLATOR	LOUVERS
HOUSE 1	3	DIS	2	4	3	2	1	2	0	0	0	13	18	4	3
HOUSE 2	3	NOR	2	6	3	2	2	2	2	0	0	17	21	3	4
HOUSE 3	3	NOR	2	6	3	2	2	2	2	0	0	17	21	3	4
HOUSE 4	3	NOR	2	6	3	2	2	2	2	0	0	17	21	3	4
HOUSE 5	3	NOR	2	6	3	2	2	2	2	0	0	17	21	3	4
HOUSE 6	3	NOR	2	6	3	2	2	2	2	0	0	17	21	3	4
HOUSE 7	3	NOR	2	6	3	2	2	2	2	0	0	17	21	3	4
HOUSE 8	3	DIS	2	4	3	2	1	2	0	0	0	13	18	4	3
HOUSE 9	3	NOR	2	6	3	2	2	2	2	0	0	17	21	3	4
HOUSE 10	3	NOR	2	6	3	2	2	2	2	0	0	17	21	3	4
HOUSE 11	3	NOR	2	6	3	2	2	2	2	0	0	17	21	3	4
HOUSE 12	3	NOR	2	6	3	2	2	2	2	0	0	17	21	3	4
HOUSE 13	3	NOR	2	6	3	2	2	2	2	0	0	17	21	3	4
HOUSE 14	3	NOR	2	6	3	2	2	2	2	0	0	17	21	3	4
HOUSE 15	3	NOR	2	6	3	2	2	2	2	0	0	17	21	3	4
HOUSE 16	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 17	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 18	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 19	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 20	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 21	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 22	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 23	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 24	2	DIS	2	3	3	2	1	2	0	0	0	12	16	3	3
HOUSE 25	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 26	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 27	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 28	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 29	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 30	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 31	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 32	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 33	2	NOR	2	5	3	2	2	2	2	0	0	16	19	3	3
HOUSE 34	2	DIS	2	3	3	2	1	2	0	0	0	12	16	3	3
EXTERNAL										11	14				
	NO. ROOMS	TYPE	2 X 2F FLOUR	40W SIRCULAR	2 X 4FT FLOUR	BULKHEAD	BEKA TYPE J	BEKA TYPE C	TRAP	400W HPS	STREET LIGHT	SWITCH	PLUGS	ISOLATOR	LUVERS
TOTAL			**68**	**177**	**102**	**68**	**64**	**68**	**60**	**11**	**14**	**543**	**664**	**104**	**115**

SINGLE QUARTERS QTY														
	BEKA TYPE C	BEKA TYPE A	BEKA TYPE B	BEKA TYPE J	4FT FLOU	2 X 4FT FLOU	BULKHEAD	BEKA TYPE P	SWITCHES	PLUGS	ISOLATORS	FAN	LOUVRES	400W HPS	STREET LIGHT
ROOMS 171	684	171	171	0			0	0	684	1026	171	171	0		
RECREATION	1		13		2	6	8		6	15	3	2	8		
LAUNDRY							3	12	3	18	12	3	12		
GANG				94											
DAKKE											79				
STOOR KAMERS				9					9						
EXTERNAL														7	15
TOTAL	**685**	**171**	**184**	**103**	**2**	**6**	**11**	**12**	**702**	**1059**	**265**	**176**	**20**	**7**	**15**

SINGLE QUARTERS QTY															
	BEKA TYPE C	BEKA TYPE A	BEKA TYPE B	BEKA TYPE J	4FT FLOU	2 X 4FT FLOU	BULKHEAD	BEKA TYPE P	SWITCHES	PLUGS	ISOLATORS	FAN	LOUVRES	400W HPS	STREET LIGHT
ROOMS 171	684	171	171	0			0	0	684	1026	171	171	0		
RECREATION	1		13		2	6	8		6	15	3	2	8		
LAUNDRY							3	12	3	18	12	3	12		
GANG				94											
DAKKE											79				
STOOR KAMERS				9					9						
EXTERNAL														7	15
TOTAL	**685**	**171**	**184**	**103**	**2**	**6**	**11**	**12**	**702**	**1059**	**265**	**176**	**20**	**7**	**15**

ALEXANDER BAY, VIOOLSDRIFT, ONSEEPKANS PORT OF ENTRY: APPOINTMENT OF SERVICE PROVIDER/S FOR THE MAINTENANCE AND REPAIRS OF BUILDING, CIVIL, MECHANICAL, ELECTRICAL INFRASTRUCTURE AND INSTALLATIONS FOR A PERIOD OF 36 MONTHS **(APPOINTMENT OF A CONTRACTOR)**

PART C4:

SITE INFORMATION

PG-03.1 (EC) SITE INFORMATION – (GCC (2010) 2nd EDITION: 2010)

Project title:	Alexander Bay, Vioolsdrift, Onseepkans Port of Entry: Appointment of Service Provider/s for the Maintenance and Repairs of Building, Civil, Mechanical, Electrical Infrastructure and Installations for a Period of 36 Months		
Tender no:	H21/002 AI	**Reference no:**	N/A

C4 Site Information

The construction sites are situated at Alexander Bay, Vioolsdrift and Onseepkans Ports of Entry.

- Alexander Bay Port of Entry is located on the Northern Cape / Namibia border approximately 11km north of Alexander Bay (GPS - S 28° 34.10' E 16° 30.36')
- Vioolsdrift Port of Entry is located on the Northern Cape / Namibia border approximately 67km north of Steinkopf in the Northern Cape Province (GPS - S 28° 46.10' E 17° 37.48')
- Onseepkans Port of Entry is located on the Northern Cape / Namibia border approximately 49km north of Pofadder (GPS - S 28° 44.38' E 19° 18.23')

The Tenderer should note that portions of the work shall be executed in security areas and that the workforce shall be required to wear positive identification at all times. The Ports of Entry are situated along the Namibia Border in the Northern Cape Province as indicated in the map below: