

Tender Specification

For the

Supply and Installation of Plumbing and Drainage Systems for South
African Medical Research Council

17167-SAMRC-917 ParoWB-MTS02

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1 SCOPE OF WORK:

Supply, delivery, installation and commissioning of:

- Hot water generation systems
- Water reticulation systems
- Water and sewage drainage systems

The contract shall include but not be limited to:

- Supply, deliver, install, test and commission of all equipment and materials.
- Temporary storage, hoisting, setting out, fixing in position, protection where required, handing over, contract guarantee
- Connection to an isolator maximum 1.5m from electrical equipment.
- 12 months free maintenance after handover
- The daily removal from site of any waste generated by the works.
- The timeous provision of details of any builder works requirements and other items that are to be supplied or provided by other contractors in order for this contract to be completed. These details are to be provided to the consulting engineer a reasonable period of time prior to the service/item being required.
- The provision of any scaffolding and lifting equipment required for the completion of the installations as described in this document and on the drawings.
- The contractor shall co-operate fully with all other trades and contractors operating on site and is to furnish and request any information necessary for the entire works to proceed in an orderly manner without interference or delay.
- Where work is to be installed in close proximity to work of other trades, or where there is evidence that work may interfere with work of other trades, the contractor shall assist in resolving space allocations and make proposals for the necessary adjustments.

2 STANDARD SPECIFICATION

- All plant equipment and workmanship covered by this contract shall in every respect comply and be carried out in strict accordance.
- All materials and equipment used shall be new and of a high quality which complies with the relevant SABS and/or BS standard or equivalent. Tenderers shall ensure that they are acquainted with the contents of SABS specifications quoted in the document.
- The installation shall comply with, but not limited to:
 - The Occupational Health and Safety Act (Act 85 of 1993) and regulations.
 - The Consumer Protection Act (Act 68 of 2008)
 - The National Building Regulation & Standards Act (Act 103 of 1977)
 - All municipal regulation laws, by-laws and special requirements of the local authority and the local supply authority.
 - The successful contractor shall at his own cost issue all notices in respect of the installation to the local authorities and shall exempt the client from all losses, costs or expenditures which may arise as a result of the contractor's negligence with the requirements of the regulations listed above.

3 MATERIALS AND WORKMANSHIP

- Unless otherwise authorized, all materials, plant and equipment shall comply with the relevant SABS standard specifications or code of practice or to the British Standard specification where no SABS standard exists.
- Materials wherever possible, must be of South African manufacture.
- All plant and equipment be correctly and competently installed, cleaned, painted and tested for operation. Any changes and adjustments required to obtain satisfactory operation shall be made by and at the expense of the contractor.
 - No materials which are themselves flammable or which supports combustion may be used, and the contractor is advised to submit samples for approval of any suspect material to the local fire authority before commencing installation.

4 INSTALLATION SPECIFICATIONS

4.1 GENERAL

- Tender and Construction drawings are schematic and do not purport to show exact positions of mechanical equipment, ducting, and piping. All final dimensions and positions must be checked prior to manufacturing and installation.
- Any clash of mechanical elements with each other or the elements of any other discipline shall be reported to the engineer, and resolved with his prior approval.
- Offsets or transformations shall be made where structural or architectural elements interfere with the straight running of ducting, pipes, trunking, and cable trays, and shall be subject to prior approval of the engineer.

4.2 METALS

- All metal items shall be supplied and installed in accordance with the specifications and details noted on the drawing and this document.
- Dissimilar metals shall be separated with rubber insert.

4.3 SITE SUPERVISION BY CONTRACTOR

The contractor is responsible for supervision on this contract. The contractor shall replace the supervisor at his own cost if the aforementioned supervisor is unable to perform his duties satisfactorily.

4.4 SUBMISSIONS BY CONTRACTOR

The contractor shall take note that all equipment selections approved or not rejected by the engineer shall not relieve the contractor of his obligations to comply with the specification.

4.5 PERFORMANCE OF SYSTEMS AND EQUIPMENT

- The systems and equipment layout designed by the engineer shall conform to his requirements with regards to installation and system performance. This suggests that the performance of the equipment in the system supplied and installed by the contractor, shall be in accordance with the design and performance figures as published by the manufacturers and/or suppliers.
- The efficiency of the design of the specified system is not the responsibility of the contractor. It is however, the responsibility of the contractor to ensure that the quality of the workmanship and the installation of the equipment shall conform to the requirements of the engineer and to the satisfaction of the supplier or manufacturer.
- It is furthermore accepted that the contractor has assured himself that all equipment supplied and installed under this contract shall perform within the given limits, as stated by the supplier/manufacturer, to conform the specification.

4.6 GUARANTEE

The new equipment shall be guaranteed for a period of 1 year from date of handover to the owner, in accordance with the requirements of the contract.

4.7 OPERATION AND MAINTENANCE MANUALS

4.7.1 General

- Provide documentation for the purpose of enabling the Principal to operate and maintain the plant and equipment together with all relevant information that would assist the Principal in carrying out the operation, maintenance, additions and/or alterations to the installation.
- Documentation shall include:
 - As installed drawings
 - Manufacturer's documentation of all equipment
 - Instructions for operation of the system
 - Maintenance procedures
 - Listings of all entered programmable parameters
 - Information relating to the expected operational life of all major system components.
 - Warranty details in excess of the defects liability period
- The details to be contained within the documents are specified in the Scope and Quality Requirements sections of this specification.
- The above documents shall be collated into a Manuals section containing printed texts and a Drawings section containing the drafted drawings.
- Submit a draft copy of the document for approval prior to practical completion.
- An interim copy of the sections of the Operating and Maintenance Manual which refers to essential and emergency services shall be provided prior to practical completion for site use until the final versions of the manual are supplied.

4.7.2 Manuals

- The manuals shall be concise and written in English language to describe the systems installed, method of operation and maintenance procedures.
- All text in the manual shall be written in terminology which is understood by non-technical personnel and prepared by personnel who are familiar with the system design and capable of providing a detailed description of the system operation and related items.
- The manuals shall include:
 - a title section including the project name, address, Principal, Engineer and Contractor
 - a listing of the name, address, telephone, facsimile, e-mail and WEB address contacts of equipment manufacturers, system installers, service companies and maintenance contractors for the contract works
 - a comprehensive index of the contents of each volume of the manual including associated drawings
 - a description of all systems in the installation including the method of operation
 - a schedule of routine maintenance and testing procedures and periods between activities
 - Manufacturer's brochures and documentation on all equipment and accessories used in the installation
 - Test reports including the results of commissioning tests for equipment and systems which have been formally tested and commissioned as required by the specification
 - Approval and compliance certificates and notices issued by Authorities, Agencies, Suppliers, Installers and Contractors

4.7.3 Drawings

- The drawings shall include the as installed drawings for the installation and final shop drawings as provided during the progress of the works.
- Drawings prepared by the Engineer may be utilised for the as installed drawings provided that all details including notes on the drawings, are revised to depict the as installed condition.

- All drawings shall be produced in electronic format (CAD) using a standard print font. Freehand or manually drafted drawings and sketches are not acceptable.

4.7.4 Hard copy manuals shall:

- Be sized with A4 pages
- Contain typewritten text handwritten documents are not acceptable
- Be bound in binder/s which is labelled with the project description, service and volume number on the cover and spine of the binder. Binders shall be hard covered, multi ring type which enables easy removal or insertion of pages
- Include original copies of printed documents of equipment by manufacturers, note that if the applicable component is only a minor part of printed manufacturer's documents, the relevant pages shall be colour photocopied and inserted in the manual
- Include dividers between sections of the manual with printed identification of the section as cross referenced in the index
- Include clear plastic sleeves to contain documents which are not suitable for binding, eg., certificates, etc

4.7.5 Electronic format manuals shall:

- Be sized with A4 paper
- Be provided in two formats:
 - Adobe Portable Document Format, PDF
 - The original source file
- Be produced to suit electronic on line documentation
- Be produced in a form suitable for use with Adobe Acrobat 5.0 software or higher
- Be produced in one of the following format files not less than a maximum three versions older than the current release version:
 - Microsoft Office
 - Adobe PageMaker
 - Adobe FrameMaker
- For pre-formatted documents produced by other software products for inclusion in the manuals, be provided in one of the following formats:
 - Adobe Portable Document Format, PDF
 - Postscript File, Level II
- Where manufacturer's documents are not available in electronic format, be provided with electronically scanned images of relevant sections of the documents in Adobe Acrobat PDF format at a resolution not less than 150dpi.
- Be provided on an indexed CD ROM labeled with the following information:
 - project name
 - service
 - drawing numbers
 - file type/s
 - date

4.7.6 Hard Copy drawings shall:

- Be provided on the same size print sheet for uniformity of all drawings
- Be bound in a set with a proprietary binding system which enables easy removal or insertion of drawings.
- Be bound in a set with a cover sheet labelled with the project description, service and volume number of the drawing set.
- Include an index of all drawings in the set

4.7.7 Electronic format drawings shall:

- Be produced in a suitable file format that can be viewed and opened by the latest two versions of AutoCAD
- Be prepared utilising one of the latest two versions of AutoCAD with all details of the layers system utilised.
- Be prepared as a black and white postscript plot file or Adobe Acrobat PDF file in the same standard as for AutoCAD printed versions
- Be provided on an indexed CD ROM labelled with the following information:
 - Project name
 - Service
 - Drawing number/s
 - File type/s
 - Date
 - Quantities

4.8 COMMISSIONING AND HAND OVER

- A phased approach as per the bill of quantities must be followed for the installation and commissioning.
- The engineer shall witness performance tests to demonstrate satisfactory operation. A condition of first delivery of the installation will be the submission in tabular form of the results of the tests on the performance of the system equipment.
- Each piece of equipment individually and each completed system as a whole shall be correctly adjusted as required giving satisfactory performance. Control systems shall be adjusted and placed in operation.
- The test results are to include but not be limited to the following:
 - Electrical current readings for all motors.
 - A checklist showing that all equipment has been checked that the connections, electrical amps drawn etc. corresponds to manufacturer data for all the equipment installed.

4.9 POST COMMISSIONING MONITORING & TUNING

- The Contractor shall monitor the control system at regular intervals following its commissioning to verify that the system is operating in the intended manner. Any control system faults detected shall be rectified. Any adjustments to set points, timers, etc., deemed necessary, shall be made subject to them being first referred to the Engineer.
- The system shall be monitored daily, until such time as no faults are detected and thereafter monitored monthly.
- The Contractors shall make all minor adjustments to the set points and program as directed by the Engineer to tune the system for optimum performance and energy efficiency.
- The Contractor shall allow for the following:
 - 12 month post project completion monthly monitoring.
 - Quarterly Reviews and Reporting.
 - Full re-commissioning carried out 12 months after practical completion in accordance with the design intent documentation.
- The building tuning process must include:
 - Verification that systems are performing to their design potential during all variations in climate and occupancy
 - Optimization of time schedules to best match occupant needs and system performance; and
 - Alignment if the systems' operation to the attributes of the built space they serve.

4.10 CO-ORDINATION WITH OTHER SERVICES

- Co-ordinate the works with all other services and including existing services within the vicinity of the works.
- Any existing services shown on the drawings are indicative only. Prior to any work being carried out, confirm location including that of any other existing services in the area of the works to be undertaken.
- Where necessary, relocate, repair and replace any existing services within the vicinity of the works. If it becomes necessary to relocate, repair or replace any such existing services, obtain all the necessary consents and approvals from the relevant authorities.
- Claims for variations, extensions of time, delay, disruption or other items, will not be allowed for failure to co-ordinate the works.
- Any equipment that is installed without due regard to other trades, shall be relocated at no additional cost.

4.11 TUITION

- Provide an experienced technical person that has a complete technical knowledge of the installation to instruct and demonstrate to the principal or his nominated representatives, in the location and method of operation and maintenance requirements of all components in the installation.
- All operating manuals and as installed drawings shall be available prior to tuition being given.

5 PLUMBING AND DRAINAGE:

5.1 GENERAL

- The plumbing and drainage installation shall be undertaken by a PIRB licensed registered plumber and persons working on the installation shall be adequately controlled by the PIRB.
- A plumbing certificate of compliance from the plumbing professional body shall be issued.

5.1.1 Fat Traps

- The grease interceptor shall be designed to be used inside a building.
- The grease interceptor should achieve maximum efficiency in promoting cooling, coagulation and retention of the grease within the separation compartment.
- The grease interceptor should produce a separation performance of at least 92% when waste water mixed with linseed oil is discharged through the interceptor.
- The grease interceptor shall be fitted with a removable lid or a manhole cover that permits easy and effective removal of grease, fat, solid matter or fine sludge, and that seals airtight.
- The grease interceptor shall be vented to prevent it from becoming air locked.
- The design and construction of the interceptor shall be such that the air space above the separation compartment is ventilated through the inlet pipe.
- The grease interceptor should not be capable of being sucked empty through the outlet pipe to an extent that light substances reach the outlet pipe;
- Parts that are essential for the operation of the grease interceptor, such as suspended pipes or immersion plates, should be constructed in such a manner that they cannot be removed

5.1.2 Hot Water Cylinder

- The hot water cylinder must comply to SANS 151:2015 Fixed electric storage water heaters.
- The installations must comply to SANS 10254:2012 – The installation, maintenance, replacement and repair of fixed electric storage water heating systems.
- The inner cylinder must be manufactured from 2mm steel and thermofused porcelain enamelled for cylinder longevity and hygiene.
- The space between the inner cylinder and outer casement must be insulated with polyurethane insulation to reduce heat loss.
- A sacrificial anode is required.
- Required product warranty:

- Spiral element, thermostat, isolator switch, flange assembly plate and gasket – 1 year
- Safety valve and drain cock – 2 years
- Inner cylinder – 6 years
- The water heater and hot water cylinder must comply to SANS 151:2015 Fixed electric storage water heaters
- The installations must comply to SANS 10254:2012 – The installation, maintenance, replacement and repair of fixed electric storage water heating systems
- The installation must be done by a qualified plumber
- The inner cylinder must be manufactured from 2mm steel and thermofused porcelain enamelled for cylinder longevity and hygiene
- The space between the inner cylinder and outer casement must be insulated with polyurethane insulation to reduce heat loss – min R value of 2 required
- A sacrificial anode is required
- Required product warranty:
 - Spiral element, thermostat, isolator switch, flange assembly plate and gasket – 1 year
 - Safety valve and drain cock – 2 years

5.1.3 Point of Use Electric Water Heater

- The water heater must comply to SANS 151:2015 Fixed electric storage water heaters
- Electric Hot Water installations must comply to SANS 10254:2012 – The installation, maintenance, replacement and repair of fixed electric storage water heating systems.
- The installation must be done by a qualified plumber
- Must be tested to SANS 60335-2-21
- The inner cylinder must be a titanium glass lined cylinder
- The space between the inner cylinder and outer casement must be insulated with polyurethane insulation to reduce heat loss – min R value of 2 required
- Must be fitted with a 1.5kW element
- Must be fitted with a large sacrificial anode
- Must be installed by a qualified plumber to supplier specifications
- Required product warranty:
 - Inner cylinder, spiral element, thermostat, isolator switch, flange assembly plate and gasket – 1 year

5.1.4 Heat Pump Water Heaters

- The installation must comply to SANS 1352:2012 – The installation, maintenance, replacement and repair of domestic water heating heat pump systems
- Installation must be done by a qualified plumber and must comply with SANS 10254, SANS 10142 and all relevant local by-laws.
- Must be supplied by a reputable local supplier, with existing locally installed units.
- Coefficients of performance (COPs) shall be above 3.5 (rated at 20°C ambient temperature, 55°C water set point, with 3 hour heating time).
- Compressors shall be of the Rotary type, and shall be factory fitted with purpose made sound attenuation for units with heating capacities below 10kW
- Compressors shall be of the Copeland scroll type, and shall be factory fitted with purpose made sound attenuation for units with heating capacities 10kW and above
- Refrigerant used shall be R417a.
- The unit shall be supplied with a purpose made control system with the following functionality:

- Multiple on/off timer settings
- Closed-loop temperature control
- Evaporator fan speed control
- Intelligent reversing valve defrost control (monitoring both time and temperature)
- Self-diagnostic test with fault indicating codes
- Wired digital remote controller
- Battery backup to maintain settings during power failure
- Auto reset after power failure
- All refrigerant controls shall be recognised industry standard components. The unit shall have electronic expansion valve(s) controlled by the microprocessor.
- Evaporator fan(s) shall have a low-noise design, and shall have multiple-speed motor(s) controlled by the microprocessor. Vertical fan discharge is preferable.
- The unit shall have a factory fitted refrigerant pressure controlled flow control valve(s). The valve(s) must maintain a constant hot water leaving temperature, and allow hot water to be piped directly into the storage tank outlet. The unit must be able to accept return water at 50°C or more.
- An easily serviceable electrical panel shall be provided. All electrical switchgear shall be supplied from reliable and recognised sources. A separate pump contactors shall be provided. The compressors shall be protected against phase reversal and phase loss.
- Casing shall be made from heavy gauge galvanized steel, and epoxy coated after manufacture and assembly.
- Piping should be lagged as per specifications elsewhere

5.2 WATER RETICULATION SYSTEMS

5.2.1 General water reticulation specification

- The water supply installation shall comply with the requirements of SANS 10252 Part 1
- All pipes and fittings shall comply with the requirements of SANS 15875 Part2, Part 3 and Part 5 or SANS 15874 Part 2, Part 3 and Part 5.
- All water taps and stop cocks shall comply with the requirements of SABS Specification 226. Ball valves shall comply with the requirements of SABS Specification 752.
- The plumbing work shall be tested in accordance with the instructions of the Representative/Agent and any imperfect work shall be taken out and renewed at the cost of the Contractor and again tested until found to be perfect.
- The Contractor is responsible for the provision of all water, pumps, etc. required for the proper testing of the water system for leakages.
- Before carrying out the pressure test of water reticulation and pipelines the entire system must be filled with water and all air evacuated. The test shall be carried out by pressurizing the water in the system to one and a half (1.5) times the expected working pressure that the installation is designed for, by means of a pump. The pressure shall be maintained at that level for a period of at least four (4) hours during which time all pipes, joints and fittings are to be thoroughly inspected. Any leakages that may appear must be repaired to the satisfaction of the Representative/Agent.
- When the system is connected to the main water supply and is operational a final inspection must be carried out under normal working pressure and any defects shall be rectified.
- All hot water pipes shall be insulated to R value of 1.

5.3 DRAINAGE SYSTEMS

5.3.1 General drainage specification

- The drainage installation shall comply with the requirements of SANS 10252 Part 2.
- All drainage pipes and fittings will be manufactured from HDPE and shall comply with SANS 967.

5.4 FIRE INSTALLATION SYSTEMS

5.4.1 General Fire Installation Specification

The Fire Installation must comply to SANS 10400-T, SANS 10400-W and to SANS 10252-1

5.4.2 Pipework

- Black Mild steel water piping shall be used with screwed ends and shall be of medium class complete with sockets, bends, elbows, tees, long-screws, back nuts and other fittings as may be required, all complying with the requirements of SABS Specification 509. Screwed joints shall be made with lead paint and hemp or PTFE tape. All pipes shall be painted red. Cut ends of pipes shall be reamed out to remove burrs.
- Pipes shall be firmly and neatly built in or fixed to walls as directed by the Representative/Agent. In order that no air may lodge in the pipes, a proper inclination shall be maintained in fixing same. If practicable, bends shall be used at angles in preference to elbows. If a reduction in the size of the pipe takes place at an angle, the bend or elbow shall be of the size of the inlet or larger pipe.
- Pipes shall be firmly and neatly fixed to walls with galvanized malleable iron brackets (School Board pattern) for pipes up to and including 80 mm diameter and with galvanized cast iron hinged holder bats fastened with brass pins or bolts for pipes over 80mm diameter. Brackets and holder bats are to be built into walls in 3:1 cement mortar. Pipes shall be fixed to timber work with galvanized mild steel pipe clips screwed on.
- No surface mounted water piping will be permitted on external wall surfaces except for a short distance of vertical rising main from ground level to floor provided this is not unsightly, all to approval of the Representative/Agent.

5.4.3 Fire hydrants:

- Fire hydrants shall comply with SABS Specification 1128 and must be supplied to the approval of the local Fire Brigade and in accordance with SABS Code of Practice 0400 as specified.
- Supply and install signage according to SABS 1186 on the door of the “security cupboard” to indicate presence of fire hydrant where applicable.

5.4.4 Fire hose reels:

- 30 Meter long 20 mm diameter fire hoses that comply with SABS Specifications 988, 1096 and 543 with reels (non-swivel type) that comply with SABS. Specification 543, including all valves, nozzles, etc., all to the approval of the local Fire Brigade and in accordance with SANS 10400 as specified, must be provided.
- The Contractor is to fix fire hose reels against walls with 10 mm diameter hook or rag bolts, not less than 150 mm long and built into walls in 3:1 cement mortar. Descriptions (prices) of fire hose reels shall be deemed to include same.
- Centre of fire hose reel to be approximately 1.5m above floor level.
- Supply and install signage according to SABS 1186 on the door of the “security cupboard” to indicate presence of fire hose reel where applicable.

5.4.5 Fire extinguishers:

- Supply Fire extinguishers in accordance with SABS Code of Practice 0400 and to the approval of the local Fire Brigade.
- Hang extinguishers on appropriate approved wall mounted hangers at heights as directed. All extinguishers to be of the refillable handheld portable types according to the capacities indicated.
- Dry powder (DCP) extinguishers in accordance with SABS Specification 810.
- Descriptions (prices) of fire extinguishers shall be deemed to include charging thereof.
- Supply and install signage according to SABS 1186 on the door of the “security cupboard” to indicate presence of fire extinguisher where applicable.

6 REFERENCE DOCUMENTATION

6.1 TENDER DRAWINGS:

DRAWING No	DRAWING TITLE
17167-ParoWB-M-P-001	Ground Floor – Plumbing Installation Layout
17167-ParoWB-M-P-002	First Floor – Plumbing Installation Layout
17167-ParoWB-M-P-003	Second Floor – Plumbing Installation Layout
17167-ParoWB-M-F-001	Ground Floor – Fire Installation Layout
17167-ParoWB-M-F-002	First Floor – Fire Installation Layout
17167-ParoWB-M-F-003	Second Floor – Fire Installation Layout

7 BILL OF QUANTITIES

(Bill of quantities on following pages)