



SARS MUSINA WAREHOUSE

WET SERVICES INSTALLATION  
SPECIFICATION  
AUGUST 2015

**SARS MUSINA**

**HOT WATER GENERATION AND HOT AND COLD WATER  
RETICULATION SPECIFICATION**

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## **Part IV**

### **GENERAL TECHNICAL SPECIFICATIONS**

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## 1. GENERAL

The layout drawings issued herewith are to be read in conjunction with the specification and all items mentioned, together with all ancillary equipment necessary for the correct installation, operation and full compliance with the Standards, Codes and Health bylaws applicable must be provided, notwithstanding the fact that they may not have been included in detail in these documents.

In this document where the term "Main Contractor", "Building Contractor" or "Builder" is used, it shall mean the Principal Contractor and where the term "Wet Services Contractor", "Contractor" or "Subcontractor" is used; it shall mean the Contractor appointed in terms of this document.

**Where the terms "or other approved" is used in connection with proprietary materials or articles, it is to be understood that approval shall be at the discretion of the Engineer.**

**Where brand or trade names are referred to in the specification or bill of quantities, these shall indicate the quality and type of material or fitting required and no substitution of materials so specified will be permitted unless the authority of the Client has been obtained in writing before tenders close.**

Quality refers to:

- The value of the article
- Sturdiness/solidity in make
- Materials
- Aspect (appearance)
- Size or volume (if important)
- Price

Performance refers to:

- The output of the article
- Economical use
- Tamper resistance
  - of article itself
  - of its fixedness
- Maintenance
  - Cost of maintenance
  - Ease of maintenance
  - Accessibility for maintenance

## 2. APPLICABLE DOCUMENTATION

The supply and installation of the Hot Water Generation system are subject to the following documents forming part of this specification:

Documentation Parts		
Part	IV	Standard Technical Specification
Part	V	Project Specification
Part	VI	Schedules of materials and Equipment offered
Part	VII	Bills of Quantities

### 3. SANS SPECIFICATION

The latest editions and amendments of the following Standards and Codes shall be considered a minimum requirement and the entire installation shall comply with these Standards and Codes of Practice unless otherwise specified elsewhere in this document, or dictated by Government, Supply Authority or Local Authority bylaws and Provisions:

SANS 10254: 2012	The installation, maintenance, replacement and repair of fixed electric storage water heating systems
SANS 1067 – 1:2005 SANS 1067 – 2:2005 SANS 1067 – 3:2013	Copper-based fittings for copper tubes
SANS 966	Components of pressure pipe systems
SANS 10142-1:2012	The wiring of premises Part 1: Low-voltage installations
SANS 1804 -1: 2012 SANS 1804 -2: 2012 SANS 1804 -3: 2012 SANS 1804 -4: 2012	Induction motors
SANS 1240:2010	Automatic shut-off flush valves for water closets and urinals
SANS 821:2007	WC flushing cisterns
SANS 151:2013	Fixed electric storage water heaters
SANS 14713 -1:2011 SANS 14713 -2:2011 SANS 14713 -3:2011	Hot-dip (galvanized) zinc coatings on steel in structures
SANS 460:2011	Plain-ended solid drawn copper tubes for potable water
SANS 62:2013	Steel pipes
SANS 10252-1:2012	Water Supply and Drainage for Buildings Part 1: Water Supply Installations for Buildings
SANS 0252-2:1993	Water Supply and Drainage for Buildings Part 2: Drainage Installations for Buildings
SANS 10400	Application of the National Building Regulations
SANS 347	Categorization and conformity assessment criteria for all pressure equipment
OHS Act	Occupational health and Safety Regulations

- 3.1 Local bylaws, as applicable.
- 3.2 The electrical installation as a whole shall comply with statutory and local laws and regulations.
- 3.3 All statutory regulations applicable to the work.

#### **4. PIPING**

##### **4.1 Piping, Water Analysis and Lagging**

- 4.1.1 The Civil Engineer will have the soil, ground water and piped water analysed to determine its corrosive action on the tubing used in the reticulation system, and will forward a copy of that report to the Mechanical Engineer. Unless he specifies to the contrary all water tubing shall be uPVC piping for below ground installations.
- 4.1.2 All piping and fittings shall be new and from approved manufacturers.
- 4.1.3 All cold water pipes where the air temperatures are below 4°C shall be lagged as follows:

##### **4.2 Hot Water and Condensate Pipes in Plant rooms**

- 4.2.1 All supply and return pipes shall be insulated with plain resin bonded glass fibre insulation with a density of 96 kg/m<sup>3</sup>.
- 4.2.2 Insulation shall be of the following thickness:
- Pipes up to 125 mm diameter - 25 mm
  - Pipes bigger than 125 mm diameter - 40 mm

##### **4.3 Expansion of Pipes**

- 4.3.1 For mono layer piping, fixed point connections (FP) shall be installed at different sections of the pipe to allow for controlled movement of the pipe.
- 4.3.2 All straight long runs in copper tubing shall be interrupted every 15m with an offset or an expansion loop.
- 4.3.3 Expansion joints shall be of the flanged bellows type. The bellows shall be of stainless steel. The expansion joints shall be fitted with sliding sleeves inside and outside and shall be capable of compensating for the expansion of the lengths of pipes shown on the drawings. For condensate pipes the bellows may be of copper.
- 4.3.4 The expansion bellows shall be "cold drawn", at the time of installation, to the extent of half the total movement and efficient guides fitted to the pipes either side of the joint to ensure the correct movement of the bellows.
- 4.3.5 All straight long runs in P.V.C pipes shall be interrupted every 15m with an offset or an expansion loop with special attention being paid to joints, support system and thrust

anchors which shall all be in accordance with the Manufacturer's recommendation and the Engineer's specification.

#### 4.4 Pipe Gradients

- 4.4.1 Water pipes shall be laid to a minimum gradient of 1 in 200 with auto air release valves positioned at the highest points and vented to the outside.

#### 4.5 Wall Buried Surfaces

- 4.5.1 Where avoidable, no pipes are to be buried in walls or floors. Where unavoidable, the buried section of piping shall include no joints (i.e labour bends only). At wall penetrations, all pipes are to be provided with P.V.C sleeves. Hot water pipes shall be wrapped in brown paper to allow movement.

#### 4.6 Surface Connections

- 4.6.1 Small diameter connections off the ring mains may be made using approved saddle connectors in conjunction with "Ball Valves" in accordance with the Manufacturer's recommendations and the Engineer's specification.

#### 4.7 De-Zincification

- 4.7.1 All brass fittings and valves shall be certified by the Manufacturers to be free from de-zincification and will be subjected to check tests.

#### 4.8 Jointing Compounds

- 4.8.1 Jointing compounds, (Teflon pipe sealer by Loctite or other approved and or P.T.F.E tape) shall be lead free and sparingly used.

#### 4.9 Connections to Fittings

- 4.9.1 Connection of all fittings (viz. Taps, cisterns machines, etc.) shall be mechanically made and not welded or hard soldered.

#### 4.10 Support of Above Ground Pipe Runs

- 4.10.1 All pipe work both vertical and horizontal shall be supported along its length with brackets capable of carrying the combined mass of the pipe and water and shall be spaced at the allowable maximum centres.
- 4.10.2 Pipe hangers are to consist of galvanised or stainless steel chain and copper pipe rings. Holderbats are to be brass or gunmetal with wall screw mountings and screwed on covers. N.B: No plastic bats will be permitted.
- 4.10.3 All copper pipes shall be electrically insulated with P.V.C from ferrous pipe clamps.

#### 4.11 Other Supports

4.11.1 Other support systems are subject to approval from the Engineer.

4.11.2 All fixings shall be made using tested and approved systems.

#### 4.12 Fittings

4.12.1 Fittings shall be PPSU (Poly phenyl sulphone) for sizes up to and including 40mm to be used with patented Q&E fitting system.

4.12.2 Wipex couplings with corresponding fittings of DZR Brass for sizes 50mm up to and including 110mm.

4.12.3 Transition fittings shall be DZR Brass.

4.12.4 The Q&E System can be applied to certain 50mm and 63mm fittings. These are the 50x50mm and 63x63mm straight joints and 50xG1 1/4" and 63 x G2" also of DZR Brass.

### 5. **VALVES**

#### 5.1 Isolating Valves

5.1.1 All toilets, kitchen areas etc. shall have a main isolating valve easily accessible to aid maintenance.

5.1.2 All isolation valves shall be Butterfly, ball or gate valves, of the NTC manufacture or equivalent unless otherwise stated on the drawings. Valves 50mm NB and smaller shall have screwed connections and above shall be flanged.

5.1.3 Where the static pressure is below 200kPa all isolating valves on the hot and cold water system shall be of the sluice or gate valve pattern.

5.1.4 "Stop-cocks" or "Ball-valves" shall precede all individual fittings i.e toilet cisterns, hot water geysers, washing machines etc.

5.1.5 All "Ball-valves" shall have hard chrome plated balls seated on Teflon seats.

#### 5.2 Non-Return Valves

5.2.1 All non-return valves shall be of the lift type pattern

#### 5.3 Automatic Air Release

5.3.1 Automatic air release valves shall be installed at all high points in the reticulation system where air locks can occur or as detailed by the Engineer.

5.3.2 Air release valves shall be preceded by an isolating valve and vented to the outside.

5.3.3 Air release valves and isolating valves may not be installed within roof spaces.



## 5.4 Float Valves

- 5.4.1 All float valves shall be of the "Portsmouth" or "Equilibrium" pattern for pipes up to 42mm diameter and the "Equilibrium" pattern for pipes above 42mm diameter.
- 5.4.2 Where the water pressure is higher than 300kPa only the "Equilibrium" pattern valve shall be used.
- 5.4.3 For pipes up to 42mm diameter "Portsmouth" and "Equilibrium" valves and control rods shall be manufactured in brass.
- 5.4.4 Floats shall be manufactured in copper, brass or plastic.
- 5.4.5 For pipes above 42mm diameter "Equilibrium" valves may be manufactured in cast iron or bronze, but in all cases shall have bronze valve seats.
- 5.4.6 Silencer tubes shall be fitted to all float valves and shall discharge near the bottom of the tank.
- 5.4.7 Float valves shall have vent holes to prevent back siphoning into the mains.
- 5.4.8 Except for cisterns, all float valves of the Portsmouth Pattern shall be fitted with submerged damper plates fixed to the floats or float arms to dampen wave action.
- 5.4.9 All float valves shall be preceded by an isolating valve and strainer.

## 5.5 Pressure Reducing Valves

### 5.5.1 Cold Water Excluding Fire Services

- 5.5.2 Where the mains pressure is in excess of 300kPa, pressure reducing valves shall be installed in pairs on the domestic line only to limit the pressure to  $300\text{kPa} \pm 20\text{kPa}$ .

### 5.5.3 The pressure reducing unit shall have as an integral part of that unit:

- A pressure release valve with drain connection to protect the cylinder against thermal expansion of the water.
- Built-in strainer.
- Built-in non-return valve associated with the reducing valve.
- Isolating valves fitted to the inlet and outlet side of the reducing valve.
- Combined temperature, pressure and vacuum release valve fitted into the delivery side of the cylinder. The T.P.V shall have a drain connection built into it and shall be fitted so that the probe is in the cylinder.
- The drain from the reducing valve and T.P.V valve shall be laid to a fall of 1 : 30 minimum and discharge over a gully.

## 6. **STERILISATION AND DISINFECTION**

- 6.1 If pipes and tanks are to be sterilized this will be as per SANS 10252-1:2012, Clause 9.3.

## **7. PRESSURE GAUGES**

- 7.1 Pressure gauges shall be 100mm bourdon type of approved manufacture with castings to match the thermometers. Each gauge shall be fitted with a 10mm stop cock. The dial range shall be selected for the required pump pressures.

## **8. FASTENERS, BRACKETS AND FIXINGS**

- 8.1 All brackets supports, hangers, base plates, etc, used externally or in damp conditions shall be hot dip galvanised to SANS 935:2007 after fabrication, after all holes have been drilled, reamed and edges filed, ground and cleaned up.
- 8.2 Bolts, nuts, washers, fixings and fasteners shall be manufactured of corrosion-proof metal, or shall be electro-galvanised.
- 8.3 Excess lengths of thread on bolts, hangers, etc shall be cut to an acceptable length, primed with a suitable metal primer and painted with an undercoat followed by an alkyd enamel finish coat.

## **9. SUPPORTING STEELWORK**

- 9.1 All supporting or structural steelwork used externally shall be either mild steel hot dip galvanised after fabrication, or 3Cr12 steel, suitably painted.
- 9.2 Manufacturing and welding of 3Cr12 steel shall be strictly to 3Cr12 manufacturer's specifications and procedures. Mild steel welding rods shall not be used.

## **10. CORROSION PROTECTION, PAINTING AND IDENTIFICATION**

- 10.1 Pipe support brackets and clamps shall be hot dip galvanised to SANS 14713:2011 (Part 1 to 3) and painted for protection with calcium plumbate followed by two finishing coats of enamel paint in accordance with the paint manufacturer's recommendations.
- 10.2 Pipelines shall be identified and labelled with the contents name or symbol and colour, adjacent to shut-off valves, at junctions and changes of direction, before and after walls and partitions, etc, at intervals of not more than 10m and adjacent to terminal units.
- 10.3 Such labelling shall be durable and effected, for example, by means of metal tags, stencilling, stamping or with adhesive markers.
- 10.3.1 Identification shall be:
- coloured and lettered in accordance with SANS 10006:2006, with letter not less than 6 mm high;
  - applied with the words and symbols to be read along the longitudinal axis of the pipeline.

NOTE – Identification shall include arrows denoting direction of flow.

- 10.3.2 If a pipeline is painted for all or part of its length the colour(s) shall be in accordance with SANS 10006 and the contents name or symbol shall also be applied as required.

## **11. GALVANISING**

- 11.1 All hot dip galvanising shall be executed in accordance with the SANS 14713:2011 (Part 1 to 3) specification for Hot Dip (galvanised) Zinc Coatings. The Engineer shall have the right to inspect all steel components before galvanising and to reject or ask for remedial treatment of any material that is considered to be unsuitable. This applies particularly to welds.
- 11.2 The galvanised coating shall be smooth, adherent, continuous and free from black spots or flux stains. Globular extra heavy deposits of zinc that interferes with the intended use of the material will not be acceptable. Excessively protuberant lumps and nodules shall be removed by hot wiping or by the skilful application of mechanical means. However, there shall remain a sufficient minimum thickness of unbroken zinc coating. Flaws on small parts and working surfaces shall be repaired only by stripping and re-dipping. The zinc bath shall contain not less than 98,5% pure zinc.

The galvanised coatings deposit thickness shall be as follows:

<b>Material Thickness</b>	<b>Coating Grams per m<sup>2</sup></b>	<b>Approximate Thickness</b>
5 mm and over	760	0,108 mm
5 mm to 2 mm	535	0,07 mm
2 mm to 1,25 mm	400	0,056 mm
Bolts and Nuts	275 - 300	0,033 mm - 0,036 mm

## **12. CONTRACTOR'S RESPONSIBILITY**

- 12.1 The specification and tender drawings generally show the character and extent of the proposed work in sufficient detail to enable the works to be competitively priced and implemented and shall not be construed as showing every detail of the work to be executed.
- 12.2 Tenderers shall therefore make allowance for all pipe work, valves, fixings, fastenings, brackets, consumables and labour intended and necessary for the proper completion and commissioning of the installation.

## **13. EQUIPMENT MATERIAL AND WORKMANSHIP**

- 13.1 The Contractor shall ensure that the same make and type of material, equipment or accessory is used uniformly throughout the installation for similar items or applications as far as practically possible, unless specified elsewhere, or approved by the Engineer.
- 13.2 All work shall be carried out in an approved, neat and orderly manner to the entire satisfaction of the Engineer and all equipment shall be installed so as to be easily

accessible for maintenance purposes. Installation work shall be carried out by suitably qualified staff under proper supervision by experienced and competent supervisory personnel.

13.3 All equipment, materials and consumables used in the installation shall be of high quality design and manufacture, incorporating materials and components of the best quality that are most suitable for the purpose. Materials damaged during transit or installation shall be replaced, all costs being for the Contractor's account. Unless otherwise specified, all material and equipment shall be new.

13.4 Every reasonable precaution and provision shall be incorporated in the design of the equipment for the safety and security of the system and of those concerned with its operation and maintenance.

## **14. EQUIPMENT SUBMISSIONS**

### **14.1 General**

14.1.1 After appointment the Contractor shall submit to the Engineer details pertaining to the equipment offered by the Contractor, with reference to meeting the requirements of the Specifications, for the approval of the Engineer.

14.1.2 The Contractor should take note that approval or non-rejection of equipment shall not free the Contractor from his obligation to comply with the specifications.

14.1.3 The following information pertaining to equipment selections shall be submitted to the Engineer, as applicable, before the equipment is installed.

- Manufacture, name and model
- Power consumption, voltages, etc
- Equipment capacity at specified conditions.
- Diagrams, tables and graphs to explain the functioning of the equipment, where applicable
- Applicable pamphlets or catalogue information:
- Name and address of manufacturer and/or distributor
- Number of years that equipment has been available in RSA
- Any other relevant information requested by the Engineer.
- Materials.

Submissions with respect to the following items are required:

- Solar absorber systems
- Pressure gauges
- Temperature sensors
- Valves
- Piping selected for the reticulation, as well as in the plant room
- Any other equipment required, as indicated by the Engineer.

## 14.2 Shop Drawings

- 14.2.1 Copies of shop drawings shall be submitted to the Engineer for approval before the relevant portions of the work is installed, compliance with the contract documents. Shop drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are prepared by the Contractor, Manufacturer, Supplier or Distributor, and which illustrates relevant portions of the work.
- 14.2.2 The Engineer's approval of shop drawings or samples is limited to check conformity with design requirements and shall not relieve the Contractor of responsibility for erection or installation fit, or for any deviation from the requirements of the contract unless the Contractor has informed the Engineer in writing of such deviation at the time of submission of shop drawings or samples, and the Engineer has given written approval for the specific deviation. The Engineer's approval shall not relieve the Contractor of responsibility for erection or installation fit, or for errors or omissions in the shop drawings or samples.
- 14.2.3 The Engineer's drawings and specifications shall be considered binding with regard to the quality, general scheme, system, arrangement and function of the Contract works. All dimensions specially marked on the drawings shall be strictly followed.
- 14.2.4 During the execution of the work one print of the latest drawings and a specification shall be available for reference on site. Any discrepancy between the Drawings and the Specification and/or Schedules shall be drawn to the attention of the Engineer immediately as such discrepancy is discovered.
- 14.2.5 The Contractor shall be responsible for all discrepancies, errors or omissions in the drawings and information supplied by him, whether they have been approved by the Engineer or not, provided that such discrepancies, errors and omissions are not due to incorrect drawings or inaccurate information furnished to the Contractor in writing by the Engineer.
- 14.2.6 The Contractor shall, at his own expense carry out alterations or remedial work necessitated by reason of such discrepancies, errors or omissions for which he is responsible and modify the drawings and information accordingly, or, if the same be done by or on behalf of the Employer because of the Contractor's failure to undertake the same, the Contractor shall bear all costs reasonably incurred therein.
- 14.3 Marked-up structural and other drawings:
- 14.3.1 Marked up and structural drawings shall include the following:
- All dimensions and positions of openings and sleeves through building structures required to fit the specified services.
  - Installation positions of glass fibre or steel frames or sleeves to be built into panels at manufacturing stage.
  - Any other requirements in respect of power supplies, connections, sleeves, etc that may be required and are not shown on the drawings.
  - All dimensions and positions of equipment bases must be specified.

#### 14.4 Shop drawings and record drawings:

14.4.1 Where equipment is indicated on the shop drawings, then the shop drawings must also be signed by the supplier of such equipment, approving the application, positioning and installation details of his equipment (i.e. heat pump type water heaters etc):

- All shop drawings shall be approved and signed by the Contractor's resident project manager. All electrical diagrams shall be approved and signed by an electrical professional registered Engineer and by the specialist controls supplier.
- Required service space around equipment (marked-up).
- Operating mass of equipment.
- Electrical operating and motor loads in amperes, and whether single phase or three phase.

14.4.2 The successful Contractor shall verify that provision has been made for all connectors, conduits, etc, as described above and that such provisions are in the correct position.

#### 14.5 Ownership and Copyright of Drawings

14.5.1 Upon or before receiving final payment, the Contractor shall return to the Engineer all such documents bearing the Engineer's name as have been stipulated to be returned. None of the documents herein before mentioned shall be used by any of the parties hereto for any other purposes than this contract and neither of the parties shall divulge or use, except for the purpose of this contract, any information contained in these documents.

### 15. BUILDING AND CIVIL WORK

15.1 All equipment foundations, plinths, pipe support bases, window panes, etc., and other works of a civil engineering nature required for the full completion of the Works under this particular mechanical technical specification will be measured elsewhere in the Bill of Quantities.

15.2 This work shall be executed in a professional manner, and the Main Contractor is responsible for any structural defects that may occur as a result of his work, and shall make good all building work relating to the Main Contractor's work.

### 16. PROTECTION OF WORK

16.1 The whole of the work, equipment, materials and fittings comprising the installation, shall be adequately protected against damage, loss and/or deterioration for the full duration of the contract. Any such damage, loss and/or deterioration occurring during transit, installation or commissioning of the Contract, shall be made good and the work handed over in a sound and clean condition on completion of the installation to the entire satisfaction of the Engineer.

16.2 All dirt and foreign matter shall be removed from piping, plant and equipment and all open ends shall be protected and plugged during the progress of the work.

- 16.3 The Contractor will remain fully responsible for all equipment and materials used in the installation until first delivery and handover has taken place and accepted and certified as such by the Engineer.

## **17. TESTING AND COMMISSIONING OF COMPLETE INSTALLATION**

The complete installation shall be tested as per SANS 347.

### **17.1 Hydraulic Testing of Water Pipes**

- 17.1.1 All water piping shall be hydraulically tested as specified in the presence of the Engineer and the results recorded.
- 17.1.2 The Contractor shall provide all the necessary equipment required to carry out the tests on the pipes. Piping shall be tested in sections as the work progresses and before being insulated, covered in trenches or wall or floor chases. The completed pipe line shall also be pressure tested just prior to take over of that line by the Client.

#### **HYDRAULIC TESTING TO WATER PIPING**

<b>Type and Class of Pipe</b>	<b>Test Pressure (kPa)</b>	<b>Duration (in minutes)</b>	<b>Permissible Water Loss MI/km</b>
Copper pipes Class 0 to 3	At a test pressure as indicated in SANS 347, at least 1.5 times the operating pressure	60	No recorded water loss
Galvanised Pipes Medium to Heavy			

- 17.1.3 All hot water piping shall be hydraulically tested to a pressure equal to 3 times the working pressures but not less than 1000kPa held for 60 minutes or as long as it takes to inspect every joint in the section being tested, whichever is the greater.
- 17.1.4 Under no conditions shall "leak cure chemicals" be introduced into the reticulation system.
- 17.1.5 All leaks shall be made good, so that the quality of the original components is not altered and so that those repairs are to the satisfaction of the Engineer.

## **18. DEFINITION OF COMPLETION**

- 18.1 The works shall only be certified as complete and as having been carried out in accordance with the specification when:
- 18.2 All omissions, defects, etc, as listed at the pre-delivery inspection have been satisfactorily attended to and made good. The Contractor has completed all preliminary testing and

commissioning, is satisfied that the installation complies fully with the specification, is ready for first delivery inspection and testing by the Engineer and has submitted the preliminary test results to the Engineer for approval prior to his attendance for first delivery, testing and commissioning.

- 18.3 Testing, setting and commissioning has taken place as specified. The acceptance test results have been recorded by the Contractor and witnessed and approved by the Engineer.
- 18.4 The specified record drawings and Operation and Maintenance manuals have been submitted, approved and handed over to the Engineer.
- 18.5 A Completion Certificate has been issued by the Engineer and all snags have been signed off as complete.
- 18.6 On satisfactory completion and acceptance of the specified tests and the Works as a whole by the Engineer, first delivery or "Practical Completion" will be taken.

## **19. GUARANTEE AND MAINTENANCE OF THE INSTALLATION**

### **19.1 Operating and Maintenance Manuals**

- 19.1.1 Four (4) copies of the operating and maintenance manuals and "As Built" drawings (both hard copies and copies on computer disc) shall be provided. Drawings stored on computer disc shall be in DXF format.

### **19.2 The manuals shall include the following:**

- Maintenance instructions for all components of the plant
- Maintenance schedules, trouble-shooting guide, part numbers of all replacement items, capacity curves of pumps, fans and compressors, belt, sizes, types and lengths, serial numbers of all principal pieces of equipment, etc.
- The names, addresses and telephone numbers of manufacturers or their agents.
- Receiver test certificates.
- A complete set of the "As-Built" drawings, both mechanical and electrical, in A3 size to be folded to fit the manuals.

- 19.2.1 The operating and maintenance instructions specified above shall be obtained from the equipment manufacturer and where no such manuals exist they shall be compiled by the Contractor.

- 19.2.2 The contract shall be considered incomplete until all tests have been conducted to the satisfaction of the Client and all drawings and manuals have been handed over. All commissioning results shall be tabulated, listing both design and measured test values, and shall be bound into the manuals.

- 19.2.3 Ringbinder files for the contents of the manuals shall be as "BANTEX" Create-a-Cover" A4 Ringbinder Reference 1282, 1283 or 1284, or other approved binding system. Files shall



be provided with matching cover and spine inserts, and stiff dividers, on which relevant information is to be neatly presented in typed or printed format. Slovenly presented or handwritten text will not be accepted.

19.2.4 Drawings shall be housed in plastic pockets, one per pocket.

### 19.3 Maintenance and Servicing

19.3.1 The Contractor shall be responsible for all maintenance and servicing of the installation during the 12 month guarantee period. Such additional items as required by the manufacturer of the equipment shall be included.

19.3.2 Four (4) services are required during this period commencing three (3) months after the first delivery inspection and spaced approximately three months apart. The final service shall be carried out before final delivery and expiry of the guarantee.

19.3.3 The Contractor shall complete the service schedules and submit copies thereof to the Client or his appointed representative after each service.

19.3.4 During the 12 month guarantee period the Contractor shall make good any defects due to inferior materials and workmanship and maintain all plant and equipment in perfect operating condition.

19.3.5 The Contractor shall maintain the plant log book on site in which he shall record, sign and date all work carried out at each inspection.

19.3.6 The Contractor shall allow for all expendable materials necessary for servicing.

19.3.7 Preventative maintenance servicing of plant and equipment shall be carried out in accordance with the maintenance schedules and programs to be supplied by the Client. Copies must be made as required of these schedules.

### 19.4 Guarantee Period

19.4.1 The Contractor shall unconditionally guarantee all new plant and equipment (machinery) for a minimum period of twelve (12) months from date of hand over to the Client.

- 19.4.2 If the Contractor or his supplier has a standard guarantee that exceeds the minimum warranty called for, the remaining portion of such extended warranty must be ceded to the Client.
- 19.4.3 The guarantee shall cover the performance of the Works and any defects due to inferior materials and/or workmanship, fair wear and tear accepted, and the Contractor shall repair any such defects without delay.
- 19.4.4 This guarantee shall include malfunction and all adjustment for correct operation.
- 19.4.5 Should any part of the complete Works perform unsatisfactorily so as to become detrimental to its functional use the Contractor shall replace any such part or the complete Works with equipment as prescribed by the Chief Director (Technical).
- 19.4.6 If any such defects are not remedied without delay, the Chief Director (Technical) reserves the right to have such defect repaired at the risk and cost of the Contractor by another Contractor whom the Chief Director (Technical) deems to be proficient in the Work. This shall be without prejudice to any rights the Chief Director (Technical) has against the installation Contractor. The Chief Director (Technical) will give written notice to the installation Contractor of such instances where he appoints another Contractor to remedy defects in the Works.

## **PART V**

### **PROJECT SPECIFICATION**

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## **1. GENERAL**

In this document where the term “Main Contractor”, “Building Contractor” or “Builder” is used, it shall mean the Principal Contractor and where the term “Plumbing Contractor”, “Contractor” or “Subcontractor” is used; it shall mean the Contractor appointed in terms of this document.

## **2. PROJECT OVERVIEW AND SCOPE OF SUB-CONTRACT**

### **2.1 Project Overview**

- 2.1.1 SARS is upgrading their warehouse facility in Musina. The installation consists of a solar absorber to supply two showers in the ablutions in the warehouse.

### **2.2 Scope of Subcontract**

- 2.2.1 The scope of the hot water generation system installation includes the engineering/shop drawings, manufacture, supply, delivery, installation, testing, commissioning, handing over, contract guarantee, servicing and maintenance of all the components of the system as specified in this document and the attached documentation and drawings.

- 2.2.2 The supply, installation and commissioning of the following systems complete with:

- Temperature and Pressure sensors
- Valves, strainers, pressure relief valves, pressure reducing valves and other fittings
- All other items required to ensure complete installation such as pipe supports, hanger brackets etc. Pipe supports shall be installed as per the standard specification (Part IV).
- Solar geyser cylinders, insulated as per the requirements
- Solar geyser panels

- 2.2.3 Installation of Copper class 1 piping for the supply of domestic cold water, including the supply point to areas served, valves, strainers, pressure relief valves, pressure reducing valves, and other fittings, as shown by the drawings, pipe supports, hanger brackets and all other items required to complete the installation.

### **2.3 Drawing Register**

The drawing register is as per the appendix to this document.

## **3. SYSTEM DESCRIPTION**

### **3.1 Piping**

- 3.1.1 The following piping shall be used:

<b>Installation Description</b>	<b>Pipe description</b>	<b>Testing requirements</b>
All water piping part of the hot water installation	Copper Class 460/1	Pressure tests will be done according to SANS 347.
All water piping part of the cold water installation	Copper Class 460/1	Pressure tests will be done according to SANS 347.
All piping used in the hot water generation plant rooms	Copper Class 460/1	Pressure test will be done according to SANS 347

3.1.2 The Contractor should ensure that the correct connection sizes at the fixtures are taken into account and allowed for to suite when installing.

### 3.2 Flow meters

3.2.1 Flow meter used will be of the dial type, and able to operate in the range as indicated in Part VI.

### 3.3 Valves

3.3.1 Isolating valves shall be installed in the plantrooms and service spaces as indicated on the drawings in order to allow maintenance such as isolating tanks, heat pumps, expansion vessel and circulating pumps. The isolating valves shall be ball valves as specified in the standard specification. The valves shall be installed in an easy to reach position and clearly labelled. All "Ball-valves" shall have hard chrome plated balls seated on Teflon seats.

### 3.4 Solar absorbers

3.4.1 Solar absorbers are to be of the indirect system type.

3.4.2 If a vacuum tube system is selected, allowance should be made for protection of the system against overheating.

3.4.3 The absorbers shall be suitably sized to provide the energy required to heat the entire storage vessel volume during the usable sun hours of a typical winter's day at an installation angle of 35° above the horizontal as per SANS 10252-1, E3.4.

3.4.4 The proposed system to be installed by the Contractor will have to be submitted to the Engineer for approval prior to the procurement of the systems. The make and model number, as well as technical information as indicated must be submitted as part of the returnable schedules.

3.4.5 The system shall be installed as per the manufacturer's specifications.

3.4.6 The element installed in the cylinder will be used to raise the temperature in the event that the solar panel is not able maintain the set temperature.

- 3.4.7 Proper controls are to be allowed for to control the system and switching the element on and off. The controls must be operated by the temperature of the water supplied to the load points.
- 3.4.8 The installation shall be in compliance to SANS 10106 and SANS 10254, complete with a temperature and pressure valve (safety valve) drain cock, expansion relief valve 100kPa and a multi pressure control valve 400 kPa, all supplied with the solar water heater. For installations inside the ceiling void, a drip tray will also be required. Vacuum breakers need to be installed on the cold water and hot water supply.
- 3.4.9 The expansion relief valve shall be installed to the jacket on the solar water heater to allow for expansion during the heating process.
- 3.4.10 For an installation in the ceiling void or on the roof, the following minimum installation clearance must be allowed for on each side of the water cylinder for maintenance purposes:
- 150 liter – 450mm
  - 200/300 liter – 920mm
- 3.4.11 In the event that the system is installed on the roof, the support structure of the installed unit must be able to support the weight of the system when the tank is filled with water.

#### **4. BUILDERS WORK**

- 4.1 All equipment foundations, plinths and other works of a civil engineering nature required for the full completion of works will be done by the main contractor to the Suppliers specifications. Workshop drawings are to be supplied to the engineer for approval.
- 4.2 It is the responsibility of the sub-contractor to ensure that a complete list of their requirements is contained in their return documents.

#### **5. ELECTRICAL SUPPLY**

- 5.1 Electrical supply isolator/s will be provided at the solar absorber as required, by the Electrical Engineer.
- 5.2 Electrical connections to the equipment will be the responsibility of the Wet Services Contractor.
- 5.3 It is the responsibility of the sub-contractor to ensure that a complete list of their requirements is contained in their return documentation.
- 5.4 Electrical COCs will be completed by the sub-contractor and will be a prerequisite to the commissioning phase.

## **6. TESTING OF SYSTEM**

- 6.1 Testing of the system during commissioning shall be carried out in the presence of and to the satisfaction of the Engineer.
- 6.2 All tests will be done according to the OHS Act as well as SANS 347.
- 6.3 Tenderers should note that the results of the tests shall comply with the requirements laid down by the local authority and By-Laws.
- 6.4 A pressure test certificate shall be completed for each section of the water system and signed by the contractor and engineer.

## **7. OPERATION AND MAINTENANCE MANUALS**

- 7.1 The tender price should allow for four copies of comprehensive Operational and Maintenance (O&M) Manuals of the system and all equipment supplied, in hard copy and soft copy format.
- 7.2 As built drawings need to be provided by the Contractor, indicating the final installation and all correct positioning of the equipment.
- 7.3 Formal training of maintenance staff of system and for all equipment must be included in the tender price.

## **8. MAINTENANCE**

- 8.1 One year maintenance to be included.

## **9. WARRANTIES**

- 9.1 Warranties and Guarantees must be clearly defined in the tender.

## **10. GENERAL**

### **10.1 Contract Description**

The works described herein shall be performed under the Main Building Contract.

### **10.2 Programme**

All work executed in terms of this particular technical specification of the Contract must be done in accordance with the programme of the Main Contractor.

### **10.3 Leveling and Fixing of Equipment**

All equipment provided under this Contract shall be carefully levelled and shimmed where necessary. Where fixing holes in equipment are provided, the equipment shall be bolted down securely using approved securing methods.

The Engineer shall be notified of any special equipment installation requirements.

#### 10.4 Electrical Power

For the use of electrical power refer to the Notes to Tenderers, Contract Conditions and Preliminaries. It is also the Contractor's responsibility to provide his own extension sockets, electrical cabling and other items deemed necessary for the execution of the Works under this Contract.



**PART VI**

**SCHEDULE OF CAPACITIES**

All installed equipment shall be as per the design, indicated by the following:

### 1. Pressure Gauges

Pressure gauges will be installed as per the specification at the ablution facility, as shown on the drawings.

Description	Requirement
150mm dial type gauge	0kPa to 1000kPa

### 2. Set points/Control points for the system

Description	Requirement
Lower set point	47 °C
Higher set point	55 °C

### 3. Solar geysers

The solar geysers will be installed as per the specifications at the warehouse and the exhibition hall, as shown on the drawings.

Description	Units	
System type		Indirect pumped solar system
Quantity	No	2
Storage tank size	L	300
Storage tank operation pressure	kPa	350
Storage tank maximum temperature	°C	50
Weight (empty/full)	kg	98/398
Storage tank orientation and location		As per the drawings
Insulation		See standard specification
Dimensions of the storage tank	Ø x L (mm)	600 x 1935
Solar absorber area	M <sup>2</sup>	By contractor
Electrical heater element	kW	2
Circulation pump (between storage tank and solar absorber)	l/h @ kPa	By contractor

**PART VII**

**SCHEDULE OF MATERIALS AND EQUIPMENT OFFERED**

**ITEM****DESCRIPTION****1. PRESSURE GAUGES**

Description	Requirement
Make	
Country of Origin	
Supplier	
Gauge description	

**2. VALVES**

Description	Requirement
Make	
Country of Origin	
Supplier	

**3. SOLAR GEYSERS**

Description	Units	
Supplier		
Model number		
System type		Indirect pumped solar system
Storage tank size	L	
Storage tank operation pressure	kPa	
Storage tank maximum temperature	°C	
Weight (empty/full)	kg	
Storage tank orientation and location		
Insulation		
Dimensions of the storage tank	Ø x mm	
Solar absorber area	M <sup>2</sup>	
Solar absorber efficiency	%	
Electrical heater element	kW	
Circulation pump (between storage tank and solar absorber)	l/h @ kPa	

## **INSTALLATION DRAWINGS**

Item	Description	Drawing Number
1	Warehouse domestic hot and cold water layout	WS-100