

WS 15 2024/25

Tender for the appointment of a contractor for the replacement and completion of the electrical and mechanical components of Temba Wastewater Treatment Works and upgrading of Babelegi Wastewater Treatment Plant for construction duration of 24 months from the commencement date

Part C3: Scope of Work

Section C3.4.4: PSM - Project Specifications for Mechanical Works

CITY OF TSHWANE
WATER AND SANITATION DEPARTMENT

CONTRACT NO: WS 15 2024/25

**TENDER FOR THE APPONTMENT OF A CONTRACTOR FOR THE REPLACEMENT
AND COMPLETION OF THE ELECTRICAL AND MECHANICAL COMPONENTS OF
TEMBA WASTEWATER TREATMENT WORKS AND UPGRADING OF BABELEGI
WASTEWATER TREATMENT PLANT FOR CONSTRUCTION DURATION OF 24
MONTHS FROM THE COMMENCEMENT DATE.**

**C3.4.4: PSM - PROJECT SPECIFICATIONS FOR MECHANICAL
WORKS**

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PSM PROJECT SPECIFICATIONS FOR MECHANICAL WORKS

PSM.GEN.1 PRELUDE AND SCOPE

This Project Specification provides details of the mechanical work, equipment and services required for the project. The scope of work covered in this specification is for the servicing of equipment, the refurbishment/repair of equipment, and the design, supply, delivery to site, installation, testing and commissioning, hand-over, giving a 12 month guarantee of new mechanical equipment for the Works. The work includes the work detailed below but is not limited to the following:

1. Servicing the existing equipment installations that were not in operation on site for prolonged periods.
2. Replacement of mechanical equipment that were damaged or vandalized beyond repair.
3. Refurbishment of mechanical equipment that cannot be commissioned due to damage or theft.
4. Supply and Installation of new mechanical equipment needed for upgrading the plant
5. Construction and Commissioning of the Plants

The specification also includes the description of items, which forms the basis of payment in the Bill of Quantities.

While this Specification lists and describes some of the equipment items to be serviced, refurbished, or new items, the comprehensive (itemized) list of such equipment or components is found in the Bill of Quantities.

The contractor will furthermore be responsible to uphold the mechanical equipment during the Defects Liability Period.

This particular specification should be read in conjunction with the following;

- Associated drawings as issued with the Tender documents; and As-built drawing of current equipment installations
- Doc_Vol1_TSM - Mechanical Technical Schedules
- DOC_Vol1_ Sect C2.2 -Bill of Quantities (Mechanical Scope) ; and
- DOC_Vol2_– Particular Specifications for Mechanical Works
- Reference Mechanical GA Drawings (As-built and Tender Drawings for information)

Where conflicts in the above-mentioned exits, this should be brought to the attention of the Engineer within a week before the Tender closes.

PSM.GEN.2 MINIMUM STANDARDS

All materials, equipment and package equipment/systems to be supplied under this contract shall be new and of the best quality available, and shall be fully compliant with the relevant SANS standards or equivalent International standards and shall also comply with the minimum standards as contained in this specification, the OHS Act and any applicable Client specifications, Department of Water Affairs, as well as The City of Tshwane Municipal by-laws, environmental, general and safety regulations, as well as to good engineering principles. The successful contractor for the mechanical works shall seek from the municipality any other pertinent specifications not stated in this document, if available.

PSM.GEN.3 PARTICULAR SPECIFICATIONS

The following City of Tshwane (CoT) Particular (Standard) Specifications also bound in Volume 2 of these Specifications shall be applicable to the Mechanical works related to this Project Specification:

List of applicable Particular Specifications:

PJ	:	Refurbishing of Mechanical Equipment
PLC	:	Chemical Dosing Equipment
PLK	:	Manufacture and Supply of Valves
PLKA	:	Sluice and Channel Gates, Adjustable Weirs Hand stops, Stoplogs
PLN	:	Manufacturing of Steel Pipes
PLQ	:	Corrosion Protection for Steel Pipes
PLT	:	In-Line Flow Meters (General)
PLV	:	Colour Coding
PT	:	Pumps (general)
PTA	:	Diffused Aeration Equipment
PTD	:	Mechanical Equipment for Heated and Unheated Digestion
PTG	:	Gearboxes
PTJ	:	Vertical Shaft Aerators
PTMa	:	Mechanical Mixers

PTP	:	Hoisting Equipment
PTQ	:	Primary Sewage Treatment Equipment
PTR	:	Sedimentation Tanks
PTS	:	Biological Filters
PTU	:	Chlorine Dosing Equipment
PTZ	:	Aeration Blower Equipment
PXC	:	Low Voltage Electrical Motors

PSM.GEN.4 THE SITE

The site is the existing Temba WWTW and Babelegi WWTW in Tshwane North, Gauteng.

PSM.IWK INLET WORKS MECHANICAL EQUIPMENT

The mechanical equipment or installations at the Inlet Works consist of three work categories; namely equipment that needs to be serviced to OEM standards, the equipment that has been damaged that need refurbishment or repaired, and finally the new equipment that was never supplied initially.

PSM.IWK.1 EQUIPMENT TO BE SERVICED

The mechanical contractor shall perform the required servicing of the mechanical equipment/installations described below according to OEM recommendations, then perform functional testing (run testing) of equipment installations to check proper functionality and ensure readiness for commissioning for each piece of equipment and/or sub-installations. The complete list of identified items under this category is itemized in the Bill of Quantities.

Servicing shall include, among other things; lubrication of rotating elements, making sure valves open and close properly (checking for leaks, replacing seals if need be), tightening or replacing of all missing fasteners, and any other major maintenance as per OEM maintenance requirements such as replacing bearings, belts, removing blockages, repairs to paint works etc, needed to make good all possible damages due to a long non-operational standing time since the initial installation.

In addition, a 12 month guarantee of mechanical equipment serviced shall be given or re-instated, starting from the date of commissioning. The Contractor shall seek and obtain all relevant equipment technical literature, the relevant governing tender design information and relevant GA drawings and As-built drawings for the installed equipment to assist in carrying out the servicing and trial running of the equipment. The list of equipment to be serviced at the Inlet Works shall include, but is not limited to the following:

1. Servicing the inlet mechanical screens as per OEM recommendations to ensure proper functionality to achieve readiness for commissioning.
2. Service the screenings compactor as per OEM recommendations, in the same way as the above mechanical screens.
3. Service the grit classifiers as per OEM recommendations, as in the above case.
4. Servicing all channel sluice gates at the Inlet Works to OEM recommendations, ensuring they open and close properly and satisfactorily.
5. 16 x 7.5 kW Balancing dam Submersible mixers need to be serviced as per OEM recommendations and be functionally tested to ensure they are in proper running order. Some or all of these mixers will require replacing electric power supply cables cut off and stolen from them, as described in the sub-section below.
6. 2 x 132 kW immersible sewage pumps need to be serviced as per OEM standards, and must be functionally tested to ensure readiness for commissioning.

PSM.IWK.2 EQUIPMENT TO BE REFURBISHED OR REPAIRED

In preparation for the completion of the mechanical installations and commissioning of the works, potential mechanical items have been identified by the Engineer that need to be refurbished. Items were identified based on a condition assessment of the items or the inaccessibility of the items due to current submergence on site. The Mechanical Contractor's scope of works will include the mechanical condition assessments of the identified equipment and any others that could have been missed out, ***and shall include a report detailing the refurbishment needed, wherever major refurbishment may be required and a provisional sum for the work required.***

The refurbishment of mechanical equipment shall be carried out in compliance to the Particular Specification PJ: "Refurbishment of Mechanical Equipment", as shown in above list of Particular Specifications relevant to this contract, which is found in Volume 2 of these Specifications.

The equipment and work in this category at the Inlet Works includes, but is not limited to the following:

1. Sluice gate shaft to hand-wheel needs to be extended to ease manual operation at the Balancing Pond.
2. Screenings press outlet pipe needs modification or extension to allow discharge into a bin under the concrete roof. The bin will be placed directly under the roof and should allow for wash water and storm drainage to be unobstructed.
3. Main Splitter box outlet valve spindles need to be extended to the top of floor grating for ease of operation.

4. Supply and reconnect cut-off power cables (check if supplied by others) to 16 x 7.5 kW Balancing Dam submersible mixers, of sufficient lengths to reach from their respective power connection terminals (e.g. the MCC), to each mixer installation location.

PSM.IWK.3 NEW EQUIPMENT TO BE SUPPLIED AND INSTALLED

While carrying out an audit to check completion of the mechanical installations, some mechanical equipment or sub-installations were identified by the Engineer to be incomplete in terms of supply and/or installation. The Mechanical Contractor's scope of works will include the re-assessments of the identified equipment installations, and any other that could have been missed, followed by the supply and installation of such equipment or components as may be needed to complete the installations to achieve readiness for commissioning of the works.

The supply, installation and commissioning of new mechanical equipment shall be carried out in compliance to the Particular Specification applicable to each relevant item of equipment, as listed below, the Particular Specifications are found in Volume 2 of these Specifications.

The work in this category at the Inlet Works includes, but is not limited to the following:

1. Supply and installation of a pipe extension to the screenings press DN 100mm return pipe, which shall consists of 2 x 45 degree bends, and about 1 m of heavy duty yellow flexible hose or a suitable equivalent plastic pipe.
2. Supply and installation of two suitably configured RS40 grating covers onto the openings behind the two mechanical screens below the screenings return line for operator safety.
3. Two off screenings wash water pumps shall be supplied and installed at a sump downstream from the degritting chambers to pump screened sewage from the sump to a 500L elevated plastic tank above the Inlet roof. The pumps shall be supplied complete with sufficient lengths of pipework (about 40-50m) and valves to connect from the pumps at the sump to the elevated tank, as well as the gravity feed pipework from the elevated tank to the screenings press (about 2-3 m length). A solenoid valve shall be supplied and installed at the entry point to the screenings wash press (in place of existing inlet control valve) to control the opening to fill up the wash water basin of the screenings press and close inflow when basin is full prior to the commencement of the screenings washing cycle. Type and nominal size of pipework to be determined by the Contractor, but is expected to be DN 80 mm, UV resistant plastic pipe.
4. 2 x new submersible degritting pumps need to be supplied and installed, one inside each of the two Vortex Degritters to pump settled grit from the bottom of the degritters to the grit classifiers via flexible pipes that connect to the installed stainless steel degritting pipes. The pumps shall be supplied complete with all installation or mounting and lifting connection ancillaries. Details of the degritting pumps are further described below.

5. DN 100 mm heavy duty flexible pipework (hoses) shall be supplied and installed, and shall be of sufficient length (6 - 8 meters, to be confirmed on site) to connect to the outlet ports of the degritting pumps above, and to the horizontal de-gritting stainless steel pipes leading to the grit classifier. This flexible pipework comes complete with all connection ancillaries (clamps etc) to connect to the degritting pumps and (quick couplings) to connect to the stainless steel pipework.
6. One DN 100 mm 304L stainless steel spool pipe missing from the de-gritter pipe installation shall be supplied and installed, full details of the pipe to match existing installed pipes, and its length shall be as per the original GA drawing used for the installation, or shall be measured on site by the Contractor, but is estimated to be about 2m long.
7. Supply and install 2 x splash covers for each of the grit classifiers, complete with all required fasteners for the installations.
8. Supply and delivery to site of new waste bins (a grit bin and a screenings bin), current target is two bins, but more may be required to suit numbers for all locations.
9. Supply and installation of a lifting davit winch with 650kg capacity and a 6mm diameter stainless steel rope and lifting hooks to be installed to lift the degritting pumps using the lifting davit frames already installed next to the vortex degritters.
10. Supply, installation, testing and commissioning of submersible drain pumps, outlet pipework and valves (if needed) for the Balancing Pond Subsoil Drainage Pump Station. Supply and installation of flexible pipes, complete with a quick release coupling to be used to connect the drainage pumps above to the outlet pipes.
11. Supply and installation of outlet steel pipework with mounting ancillaries to be used to connect from flexible pipes from the drainage pumps to the outlet channels. The size and type of pipework shall be as per the construction drawing(s) that will be approved for the pump station, but is expected to be DN 80 mm stainless steel pipework.
12. Supply and install a locable grid for the Balancing Pond Subsoil Drainage pump station roof.
13. Supply and install a footing for the lifting davit to be installed to lift the above drainage pumps using the mixer lifting equipment.
14. Supply and install 304 Stainless steel cat ladder in the Subsoil drainage pump station, as per the GA drawings, for access to the pump station for maintenance.
15. Supply and install 2 x new 132 kW immersible sewage pumps as standby pumps, next to the existing pumps. The new pumps shall be supplied complete with pipework and valves as per the GA configuration drawings approved for construction. The pumps shall have identical duty to the other two pumps already installed. Supply and installation of these

pumps shall comply to the relevant Particular Specifications PT: Pumps (general) bound in Volume 2 of these Specifications, under the category of submersible pumps. A cooling jacket for the Immersible pumps shall be provided as per Clause PT 7.3: Cooling System; of the Particular Specification stated above.

16. The proposed general layout of the new pump installations based on available space (on the As-build drawings) at the Pump Station, shall be submitted for approval prior to ordering the equipment/material. Details of the new pumps, pipework and valves are further described below.
17. 1 off new submersible drainage pump need to be supplied and installed at the Balancing Pump station drain sump to drain the flooded pump house. The pumps shall be supplied complete with all installation or mounting ancillaries, pipework and valves. Details of the drainage pump are further described below.
18. The scope of work will also include the supply and installation of a manual trolley and chain block to be installed on the existing I-beam and used for the maintenance of the above-mentioned immersible sewage pumps and the submersible drain pump.
19. Additional footings for the Lifting device shall be installed where needed to service the submersible mixers such that every submersible mixer can be reached with the available lifting davit.
20. New adjustable Weirs shall be installed in the Main Splitter box as per Drawing No. COT-IT-MEC-01-TD02 provided.

PSM.DR1.1 Design Requirements for Grit Pumps and Pipework

Two (2) off submersible grit pumps, shall be designed, supplied, with one pump installed at the bottom of each of the two vortex de-gritting chambers to pump accumulated grit into each of two grit classifiers. The pumps shall be designed to suit the requirements of the grit classifiers, and shall comply to Clause PTQ 6.1: Submersible Grit Pumps; of the Technical Specification PTQ: Primary Sewage Treatment Equipment, and current estimates are that the pumps are to have the following characteristics:

- | | | |
|---------------------|---|--|
| • Type of pump | = | Submersible, with settled grit fluidizing ability |
| • Flow Rate | = | 15.7 l/s for each pump (to suit grit classifier installed) |
| • Total Head | = | 10 m (to suit grit classifier installed) |
| • Pumping Medium | = | Raw sewage grit mixer |
| • Solids Capability | = | 75 mm solids (minimum) |
| • Discharge outlet | = | DN 100 mm |
| • Pump speed | = | 1435 rpm |
| • Efficiency | = | 57 % minimum |
| • Absorbed Power | = | 2.32 kW (to be confirmed) |

- Motor voltage = 400V
- Motor Rating = 3 kW (to be confirmed)
- QTY = 2 (1 pump for each degritting chamber)

The above pumps shall be suitable for grit pumping applications and capable of fluidizing settled grit to pump it to the grit classifiers. The pumps shall be supplied complete with all installation accessories for the pumps in the vortex de-gritting chambers, and shall include sufficient lengths of connecting flexible pipework (already described above) with all needed connecting ancillaries from the grit pumps to the grit classifiers supply stainless steel pipework. The supply scope shall also include an additional DN 100mm 304 stainless steel pipe missing from the previous installation of stainless steel de-gritting pipework. Flexible pipe sizes and lengths shall be confirmed by the mechanical contractor on site, but is assumed to be DN 100 mm like the stainless steel pipes, and 6-8 m long.

PSM.DR1.2 Design Requirements for the Subsoil Drain Pumps and Pipework

Two (2) off subsoil drain pumps, shall be designed, supplied, installed at the subsoil drain pump sump to pump seepage water collected from around the periphery of the Balancing Dams onto a drain channel. The pumps shall be designed to suit the required duty, of which indications are that the pumps are to have the following characteristics:

- Type of pump = Submersible drainage pump
- Flow Rate = 5 l/s for each pump
- Total Head = 10m
- Pumping Medium = Seepage water (possibly with some sand particles)
- Solids Capability = 10 mm solids
- Pump speed = 1350-1450 rpm
- Efficiency = 50% minimum (or as high as possible)
- Absorbed Power = kW (to be confirmed)
- Motor Rating = 1.5 kW (to be confirmed)
- QTY = 2 (1 duty, 1 standby)

The above pumps shall be suitable for seepage water with possible sewage contamination, and possibly small solids. The pumps shall be supplied complete with all required installation and lifting accessories for the pumps in the subsoil drainage sump, and shall include sufficient lengths of connecting flexible pipework with all needed connecting ancillaries, like clamps or quick couplers from the pumps to the steel pipework connecting to the drain channels. Pipe sizes and lengths shall be confirmed by the mechanical contractor on site, or as per the GA drawings used for installation.

PSM.DR1.3 Design Requirements for Screenings Washwater Pumps and Pipework

Two (2) off screenings wash water pumps shall be designed, supplied, installed at the channel downstream to the degritting chambers to pump screened sewage back to the wash water elevated tank above the Inlet Works roof, to be used to feed the Screenings Wash Press gravity feed pipework. The wash water pumps shall be designed to suit the required duty, of which indications are that the pumps are to have the following characteristics:

- Type of pump = Vortex impeller type submersible pump

- Flow Rate = 5-7 l/s for each pump (to be confirmed)
- Static head = 10 m
- Total Head = 11m (estimated)
- Pumping Medium = screened sewage
- Solids Capability = 40 mm solids
- Pump speed = 1450 rpm (max)
- Efficiency = 50% minimum (or as high as possible)
- Absorbed Power = 1.51 kW (to be confirmed)
- Motor Rating = 2.2 kW (to be confirmed)
- QTY = 2 (1 duty, 1 standby)

The above pumps shall be suitable for screened sewage after the vortex degritters. The pumps shall be supplied complete with all installation accessories for the pumps in the existing 900mm deep sump on the west side old pump station wet sump. The scope of supply shall include sufficient lengths of connecting pipework with all needed connecting ancillaries from the pumps to the elevated tank above the roof of the Inlet Works. The supply scope shall also include all required valves for the pump system. Pipe sizes and lengths shall be confirmed by the mechanical contractor on site.

PSM.DR1.4 Design Requirements for Balancing Pond Immersible Pumps, valves & Pipes

The Balancing Pond pump station has two immersible pumps installed to pump sewage from the Balancing Dams to the new Flow Division chamber at the Main Works. Suction and discharge pipework for future connection of an additional two pumps has been provided at the pump station, and isolated with blank flanges. The Mechanical Contractor shall therefore design, supply, install test and commission new pumps as standby pumps, together with suction and discharge pipework and valves to connect to existing suction and discharge pipework. The required equipment is as described below:

1. Two (2) off immersible sewage pumps shall be designed, supplied, installed at the provided space in the pump station. The pumps shall be designed to match the duty of the existing pumps, and the general arrangement of these pumps and their pipework and valves shall suit the available space and pipework installations. The pumps are to have the following characteristics:

- Type of pump = Immersible pumps
- Flow Rate = 360 l/s pump
- Static head = 7m (min) -14 m (max)
- Total Head = 25 m
- NPSHr = 6.11 m (max)
- Pumping Medium = raw sewage
- Solids Capability = 127 x 110 mm diameter solids
- Efficiency = 76% minimum (or as high as possible)
- Absorbed Power = 121 kW (to be confirmed)
- Motor Rating = 132 kW (or lower)

- Motor speed = 1490 rpm (max)
- QTY = 2 (both for standby pump installations)

The above pumps shall be suitable for degritted sewage from the Balancing Ponds.

2. Suction manifold pipe specials, made up of DN 500 mm and smaller steel pipes, flanges, and reducers to suit pump inlets for both pumps, as per the GA drawing that will be approved for the construction. This pipework shall include all required connection ancillaries for instrument connections (e.g. pressure gauges, flow switches etc.).
3. DN 500 mm and DN 400mm discharge manifold pipework, complete with connecting flanges, elbows, and reducers to suit connections between both pump outlets and existing installed pipework, as per the GA drawing that will be approved for the construction. This pipework shall also include all required connection ancillaries for instrument connections (e.g. pressure gauges, flow switches etc.).
4. 2 x pump inlet isolation valves (on current installations these are DN 500 mm knife gate valves),
5. 2 x VJ flange adaptors for flexible connection between pumps and inlet manifold pipework (currently these are DN 300 mm to suit inlet ports of existing pumps)
6. 2 x pump discharge pipe isolation valves (currently these are DN 400 mm knife gate valves).
7. 2 x pump discharge pipe non-return valves (currently these are DN 400 mm size).

PSM.DR1.5 Design Requirements for Balancing Pond Pump Station Drainage Pump

The Balancing Pond pump station has a drainage sump for the collection of all gland leakage and drainage of the pipes onto the pump house floor. The drained sewage water needs to be pumped out of the pump station to keep the pump house dry. The Mechanical Contractor shall therefore design, supply, install test and commission a new submersible drainage pump, together with discharge pipework and valves (if needed) to pump out sewage water to drain the pump house. The required equipment is as described below:

One (1) off submersible sewage pump shall be designed, supplied, installed at the provided sump in the pump station. The pump and connecting drainage pipework shall be designed in such a way that the pump can be lifted from the installation sump using the installed overhead crane for the lifting of the immersible pumps. The drainage pipework shall connect up the walls of the pump house and be reticulated appropriately in such a way as to connect to the nearest hole or outlet on the building leading back to any part of the Balancing Pond. The drainage pump is to have the following characteristics:

- Type of pump = Submersible pump
- Flow Rate = 5.66 l/s
- Total Head = 10.6 m
- Pumping Medium = raw sewage
- Solids Capability = 40 mm solids
- Efficiency = 55% minimum (or as high as possible)
- Absorbed Power = 1.18 kW (to be confirmed)
- Motor Rating = 1.8 kW (or lower)

- Motor speed = 2780 rpm (max)
- QTY = 1 (duty)
- Other = Pump to be fitted with float switch for automatic operation

The above pump shall be suitable for sewage from the Balancing Ponds. The scope of supply shall include all the pipework and mounting ancillaries (and isolation valve, if any needed) for connecting from the sump pump to the offloading point for the drained sewage water.

PSM.GR2.0 General Requirements for the New Pumps at the Inlet:

1. The new pumps for the various applications as stated above shall be manufactured by reputable and established suppliers with a proven track record of similar local installations with full back up services and comprehensive technical information on the equipment. The design of the pumps shall be adequate for conditions prevailing in waste water treatment works and only new material and components may be used in the manufacture.
2. The contractor must ensure that the pumps selected are capable of achieving the requirements for each application.
3. The pumps must have the appropriate solids handling capacity as specified for each application, ranging from 5 to 110 mm diameter.
4. Internals of those pumps in contact with the grit mixture must be adequately protected against wear and details thereof must be provided with the tender for evaluation purposes.
5. Unless already catered for on site, a stainless steel grade 304 L lifting davit must be supplied to lift each pump from its installation position in one single action. This davit must be equipped with a winch system adequately sized for the weight of the pump and possible contents inside the pump at the time of removal.
6. Each pump must be supplied with stainless steel chain/cable and hooks to secure the position depth inside the installation chamber and flexible pipe work suitable for the handled medium, such as the grit mixture must be supplied and connected to the permanent steel pipework, where applicable, such as the stainless steel pipework connecting the pumped grit to the grit classifier.
7. If the submersible pumps are not equipped with non-return features, check valves must be supplied with the pipe work (where necessary) and these should be suitable for the pumped medium such as the grit-laden environment for the de-gritting system.
8. For the grit removal system the operation shall ensure that the grit pump and the grit classifier are electrically controlled through a timer system set-up in an adjacent control panel provided by the electrical contractor. The grit is pumped by the grit pump from the grit chamber into the grit classifier according to pre-set intervals in the control panel.
9. Approximately 5 -10 minutes after the grit pump has completed its cycle and the grit has had time to settle, the classifier will start up and discharge the grit into the grit waste container (bin) provided.

10. The water return will flow from the grit classifier, directly into the grit chamber below, during the pumping cycle. The Mechanical Contractor shall ensure that the installed water return line from the grit classifier is extended appropriately to drain upstream to the mechanical screens.

11. The mechanical contractor shall inform the electrical and civil contractors regarding any electrical and civil requirements of the system at an early date to enable sufficient provisions to be made for any such requirements.

PSM.BIO BIOLOGICAL REACTOR MECHANICAL EQUIPMENT

The mechanical equipment or installations at the Biological Reactor consist of equipment that needs to be serviced to OEM standards, and new equipment that was never supplied initially.

1. PSM-BIO.1 EQUIPMENT TO BE SERVICED

The mechanical contractor shall perform the required servicing of the following equipment according to OEM recommendations, then perform trial running or testing to check functionality to ensure that the installed equipment is operational and ready for commissioning. In addition, ***a 12 month guarantee of mechanical equipment serviced shall be given (re-instating original OEM guarantee), starting from the date of commissioning.*** The Contractor shall seek and obtain all relevant equipment technical literature, the relevant governing tender design information and relevant/As-built GA drawings for the installed equipment to assist in carrying out the servicing and to check the applicable performance requirements of the equipment. The list of equipment to be serviced at the Biological Reactor shall include, but is not limited to the following:

1. 4 x 110 kW surface aerators need to be serviced as per Motor and Gearbox OEM standards.
2. 4 x 75 kW surface aerators need to be serviced as per Motor and Gearbox OEM standards.
3. 4 x 55 kW surface aerators need to be serviced as per Motor and Gearbox OEM standards.
4. All Aerator levels to be adjusted to final position using the jacking bolts and the draft tubes shall be extended where necessary. Adjustment heights are expected to range up to 150mm. 12 off aerator draft tubes need to be raised to allow better oxygen transfer and mixing during operation.
5. 4 x 11kW vertical screw pumps need to be serviced as per OEM standards.
6. Sub drainage pumps need service, and new Lifting gear (A-frame) need to be installed to help the handling of these pumps.
7. 4 x actuated pinch valves are to be inspected and serviced, and tested to ensure satisfactory operation.

8. All installed valves shall at the various sub-locations be serviced to OEM standards, with seals replaced as necessary, and the valves shall be functionally tested to ensure proper and satisfactory operation.
9. Return Activated Sludge pumps need a major service, including new V-belts, and lubrication, Contractor to follow OEM guidelines for inspection and maintenance of the Rotating assembly (additional pulleys shall be supplied for pulley changes during commissioning as described below).

2. PSM-BIO.2 NEW EQUIPMENT TO BE SUPPLIED AND INSTALLED

An audit to check completion of the mechanical installations by the Engineer identified the following items of equipment as incomplete in terms of supply and/or installation. The Mechanical Contractor's scope of works will include further assessments of the installed equipment, followed by the supply and installation of such equipment or components and any others that could have been missed, that will be needed to complete the installations to achieve readiness for commissioning of the works.

The supply, installation and commissioning of new mechanical equipment shall be carried out in compliance to the Particular Specification applicable to each relevant item of equipment, as listed below, the Particular Specifications are bound in Volume 2 of these Specifications.

The equipment in this category at the Biological Reactor includes, but may not be limited to the following:

1. Manual trolleys and chain blocks to be installed on the steel structures with crawl beams already provided for aerator maintenance.
2. Installation of 4 x new V-notch Weirs for the activated sludge control as detailed in the relevant GA drawings.
3. Supply new pulleys. Allowance to be made for pulley changes during commissioning for pump speed adjustments (pumps to undergo major service as stated above).
4. Supply and installation of suction and discharge removable pressure gauges complete with ball valves and connection fittings where needed.
5. Flow meters supplied by others but not installed (if any) shall be installed complete with flange adaptors at the spaces provided in the flow meter chambers.

PSM.CLF CLARIFIER MECHANICAL EQUIPMENT

The mechanical equipment or installations at the Secondary Clarifiers consist only of equipment that needs to be serviced to OEM standards, including minor repairs that cannot be classified as a refurbishment.

The mechanical contractor shall perform the required servicing of the mechanical equipment at this section of the works according to OEM recommendations, then perform trial testing to check functionality and ensure readiness for commissioning is achieved for each piece of equipment or sub-installation. In addition, ***a 12 month guarantee of mechanical equipment serviced that would have been given by the original equipment supplier shall be re-instated, starting from the date of commissioning.***

The Contractor shall seek and obtain all relevant equipment technical information and required performance requirements as per the original tender, including verifying from the relevant/pertinent GA drawings for the installed equipment to assist in carrying out the required servicing of the equipment. The list of equipment to be serviced at the Secondary Clarifiers shall include the following:

1. The clarifier floor scrapers are fully installed, the Contractor needs to inspect the condition of the rubbers and replace these if necessary.
2. Centre bearing needs service and lubrication. Lubrication pipes to be installed also.
3. The slip ring on one clarifier needs to be replaced, the other one is to be inspected and serviced.
4. Replace all the scum scraper rubbers (damaged by the sun)

PSM.LPD LIME AND POLYMER DOSING EQUIPMENT

The mechanical equipment supply or installation for the Lime and Polymer Preparation and dosing for the WAS treatment system was never completed, and in addition, some of what was installed initially had been vandalized. The scope of works for the Mechanical Contractor will include a detailed re-assessment of all that that needs to be supplied and done to complete the installations of equipment or sub-systems to render the installations ready for the commissioning of the works.

Since some of the equipment components have been installed, this whole exercise of bringing equipment installations to completion to achieve readiness for commissioning in this section of the works shall be regarded as a Refurbishment of the existing equipment, with missing components (either new, never supplied previously, or replacement of vandalized) being treated as mandatory replacement components for the system as a whole. Nonetheless, the Mechanical Contractor shall refer to the relevant Particular Specifications as stated above when procuring new items to ensure they comply to relevant requirements (e.g. PLC: Chemical Dosing Equipment) The Contractor will also carry out necessary functional testing of installations upon completion to ascertain readiness for commissioning.

The refurbishment of mechanical equipment shall be carried out in compliance to the Particular Specification PJ: "Refurbishment of Mechanical Equipment", as listed above, which is found in Volume 2 of these Specifications.

The audit done on this section of the plant identified the following components (among others that could be identified by the Mechanical Contractor) as needing to be supplied and installed to complete the installation:

1. The rotary extraction valve is to be supplied and/or installed for the Lime Dosing System.
2. The Lime screw feeder, mixing bowl and load cells to measure the weight of the product need to be supplied and installed (or retrofitted to already installed equipment).
3. Polymer mixing and dosing pumps are installed, piping to the dosing points need to be repaired in some places. The proper functionality of these pumps needs to be assessed with a view to replacing them with new equivalent pumps if necessary.

PSM.FLC CLARI-FLOCCULATOR EQUIPMENT

The mechanical equipment installations for the Clari-Flocculator are intact and completely installed. The scope of works for the Mechanical Contractor is the servicing of the equipment in preparation for the commissioning of the works.

The audit done previously on this section of the plant identified the following as needing to be serviced:

1. A major service is needed on the bridge drives (geared motors), bearings and slip-ring. Lubrication pipes for the central bearing are to be installed.
2. Waste Activated Sludge Pumps need major service and/or refurbishment, including new motors, V-belts, VJ couplings (DN 300mm), replace one eccentric reducer (DN150-300mm), new gaskets and lubrication, contractor to follow OEM guidelines for inspection and maintenance of the rotating assembly (additional pulleys to be supplied for speed adjustment during testing and commissioning). One of the self-priming pumps is missing the rotating elements (impeller etc).
3. Supply and installation of removable suction and discharge pressure gauges for WAS pumps, piping to be fitted with ball valves and connecting sockets for the gauges.
4. All installed valves for the WAS pump system are to be serviced to OEM recommendations, replacing valves seals where needed.
5. Gate valves and spool pieces are to be installed complete with flange adaptors at the spaces provided in the WAS system flow meter chambers.
6. Waste Activate Sludge (WAS underflow) submersible pumps need to be serviced to OEM guidelines, and all connected valves to be serviced as well.
7. Supernatant Activated Sludge pumps need major service, including new V-belts, and lubrication, Contractor to follow OEM guidelines for inspection and maintenance of the rotating assembly.
8. Pressure gauges discussed above shall be supplied to be used for these pumps as well during commissioning & maintenance.

9. All installed valves for the Supernatant Pump Station are to be serviced to OEM recommendations, with valves seals replaced where needed.
10. Flow meters to be installed complete with flange adaptors to spaces provided in the flow meter chambers (Supernatant Pump system).
11. The two air blowers (supplying air to the Ammonia stripping towers) to be services to OEM standard, if stripping them apart is required, this should be done, and a report generated to inform of required maintenance. Pressure Safety valves to be installed and set.

PSM.DEW SLUDGE DEWATERING EQUIPMENT

The mechanical equipment for the Sludge Dewatering System consist of equipment that needs to be refurbished (if still refurbishable), and new equipment to be supplied and installed.

A dewatering belt press was initially supplied and installed, with the previously installed dewatering press now completely vandalized seemingly beyond any (reasonable and economic) repair, and was not installed with any ancillary pipework and supporting sub-installations. Based on the recent inspection and assessment of the installed dewatering presses, it may not be possible nor cost effective to refurbish the equipment and also get a new equipment guarantee on the reliability on the refurbished dewatering press. Hence a new dewatering press needs to be supplied and installed complete with all related sub-installations such as sludge holding or conditioning tanks, sludge feed pump system, chemical (polymer) make up and dosing system, belt wash water, dewatered sludge conveyance to existing sludge cake conveyor (also to be refurbished, if possible), and all other related equipment or sub-systems.

The scope of works for the Mechanical Contractor is the design, supply and installation of the suitable replacement equipment for the Dewatering system. A complete Dewatering System installation should feature at least a dewatering presses, a sludge storage and/or conditioning tank with pipework and valves to feed sludge from the sludge dams, a belt wash water storage and booster pumping system featuring high pressure booster pumps, pipework and valves feeding the belt presses, a sludge feed pumping system feeding sludge from the Sludge Storage tanks to the belt presses, a polyelectrolyte make-up, storage, and dosing system featuring VSD controlled progressive cavity pumps and dilution a water pump system, complete with all pipework and valves and with an inline mixing of polyelectrolyte and sludge before the belt presses. Further details of the required Sludge Dewatering System are described below.

1. PSM.DEW 1 EQUIPMENT TO BE SERVICED, REPLACED OR REPAIRED

The audit done previously on this section of the plant identified the following as needing to be serviced or replaced at these section of the Works:

1. Sludge Dams division box hand stops to be supplied (where missing) and installed, the design of the hand stops is as per the previous GA drawings. The Mechanical Contractor shall replace all the missing hand stops with new ones.
2. All floor grating and weirs at the WAS Sludge Division Box to be replaced with new items as per the GA drawing dimensions available.

3. Hand wheels are to be provided for sludge outlet valves, wherever they are missing. Replace all missing hand gates for the sludge drying beds. Replace all missing pipe bends (currently only one missing) downstream to sludge beds filling isolation valves. Replace all bolts and nuts for the various isolation valves at the Dewatering Section. Supply and install 4 new DN 200mm isolation valves, similar to those already installed for better control of the sludge distribution to the various drying beds from the HDPE supply pipe.
4. HDPE piping inside Sludge Holding Dams needs to be repaired.
5. The existing Sludge Conveyor shall be refurbished, with a new drive to be installed and the chute modified to avoid clashing. This sludge conveyor shall service the dewatering press installed. The Contractor shall ensure that the setup of the belt press is such that it can feed dewatering sludge cake from the belt press to this sludge conveyor.

2. PSM.DEW 2 NEW EQUIPMENT TO BE DESIGNED, SUPPLIED & INSTALLED

1. SLUDGE DEWATERING BELT FILTER PRESS

A new sludge dewatering system shall be supplied and installed at the existing Dewatering Building next to the Sludge Dams. The new dewatering system shall be a Package Plant designed according to the requirements of the plant and shall consist of equipment design for the following conditions:

Design Data

- Application : Municipal waste water
- Type of sludge : sludge from ponds and sludge age of 30+ days
- Number of units : 1
- Design solids loads : 250 kg Ds/h
- Inlet concentration : 5 – 10%
- Design hydraulic flow rate : 5 m³/h (at 5% DS), 2.5m³/h (at 10% DS)
- Expected polymer consumption : up to 3-5kg/ton DS of active product
- Expected minimum cake solids : 16% after belt press
- Expected solids capture : ≥ 90%
- Expected solids in the wash water & filtrate : 1000 mg DS/l (max)

- Other : Fully enclosed cascade system type

2. POLYELECTROLYTE MAKE-UP AND STORAGE SYSTEM

The polyelectrolyte make-up and storage system shall consist of the following components:

- 2 x 2500 litre tanks with mixers
- 1 x polymer solution transfer mono pump with 5.5 kW electric motor, with pump delivery of 3 l/s

3. POLYMER FEED PUMPS AND PIPEWORK

The polymer feed pump system shall consist of the following components:

- 2 x polymer dosing mono pumps driven by 1.1kW electric motor (VSD controlled), with pump delivery of 250 l/h (max)
- Dosing pipework, including valves to be 25mm Class 9 uPVC that will connect into the sludge feed pipeline prior to the inline static mixer.
- Measurement of polymer will be via a Magflow meter.

4. POLYMER DILUTION WATER PUMPS AND PIPEWORK

The polymer dilution water pump system shall be connected to a nearby potable water connection point and shall consist of the following components:

- 2 x polymer dilution water mono pumps driven by 1.1kW electric motor (VSD controlled), with pump delivery of 250 l/h (max), (to be confirmed, but to meet dilution water flow requirements)
- Dilution pipework, including valves to be 25mm Class 9 uPVC that will connect into the polymer feed pipeline prior to the poly feed point on the sludge pipe.
- Measurement of dilution water will be via uPVC rotameters.

A potable water supply shall be needed for both polymer make-up water and the dilution water supply. The contractor shall connect the supply for potable water for poly make up

and dilution to the nearest potable water connection point, and hence shall supply all required pipework and valves after determining the location of this pipeline from the Dewatering Building.

5. SLUDGE FEED PUMP SYSTEM

A Sludge feed pump system, complete with positive displacement type sludge pumps, pipework, valves, an online sludge/polymer mixing device, and all ancillaries from the sludge holding tanks to the dewatering presses feed points shall be designed to suit the Dewatering Press, supplied and installed by the Mechanical Contractor. The length of the sludge feed pipeline reticulation between the sludge/polymer mixing device and the feed point at the belt press must allow sufficient contact time between the sludge and polymer to reach the targeted sludge conditioning (to assist any flocculation tank in the belt press) for the optimal belt press dewatering operation.

6. DEWATERING PRESS WASH WATER PUMP SYSTEM

A Dewatering Press belt wash water pumping system shall be designed, supplied and installed by the Mechanical Contractor, and is expected to include the following:

- a. Wash water storage tank receiving wash water from the existing wash water reticulation pipeline from the Irrigation Pumps next to the Chlorine Contact Tank. The contractor shall check to ensure the water supply flow rate from the reticulation pipeline is sufficient for the requirements of the belt wash water system; supply pressure is presumed to be sufficient to fill up the wash water storage tank, but Contractor to verify if the required flow is sufficient, and make appropriate recommendations to meet the requirements of the selected filter belt press wash water requirements.
- b. Wash water booster pumps (1 duty, 1 standby), pipes, valves and all associated ancillaries sized to suit the required water flows and pressure for the belt washing nozzles, and connecting from the storage tank to the wash water connection points on the belt presses. The duty and all other details of the pumps shall be confirmed by the Contractor, but wash water pressures at the belt wash nozzles of 6 bars are envisaged. The proposed selection and accompanying technical details of the pumps shall be submitted for approval together with the Package Dewatering press prior to placing of orders for the equipment.

7. General Requirements of the Dewatering System

The design of the dewatering system shall comply to the above design information. The proposed complete dewatering system technical details, including all sub-

assemblies/installations shall be submitted for review and approval to the Engineer prior to placing an order.

8. SLUDGE HANDLING SKIT AND TURNING EQUIPMENT

The Mechanical Contractor shall supply and deliver to site equipment for the handling and turning of the dewatered sludge at the Drying Beds. The equipment shall consist of the following:

1. Skid Steer Loader or similar equipment for moving sludge and equipment around the Wastewater Treatment Plant, which shall also comply to the following specifications:
 - a. The Skid Steer Loader shall be a locally available and supported brand product with an enclosed cabin with air conditioning for the operator/driver
 - b. The rated power for the engine shall be 50hp (37kW) minimum
 - c. The overall width of the machine and bucket shall not exceed 1700mm
 - d. Ground clearance shall be 200mm
 - e. Bucket capacity shall not be less than 0.3m³
 - f. Operating capacity shall not be less than 500kg
 - g. The Skid Steer Loader shall be compatible with a standard agricultural rotovator to turn over saturated sludge on a concrete floor.
 - h. Full details of the proposed Skid Steer Loader shall be submitted for approval with the tender.
2. Rotovator
 - a. The equipment shall be a standard agricultural rotovator suitable to turn over saturated sludge and be connected to and operated from a tractor or Skid Steer Loader described above.
 - b. The rotovator shall also be fitted with some measures (sliding shoes or wheels) to prevent it from eating into the concrete floor slab of the sludge drying bed.

PSM.CHL CHLORINATION & DISCHARGE EQUIPMENT

The mechanical equipment installations for the Chlorination System need to be re-checked for completeness of supply and installation, including compliance to all safety and other applicable regulations, the Chlorination system installation is to comply to SANS 10298. The scope of work for the Mechanical Contractor is the re-auditing of the chlorine dosing installation (supplying and/or installing any missing items) to ensure completeness, and the servicing of the chlorine dosing equipment in preparation for the commissioning of the works.

The audit done previously on this section of the plant identified the following as needing to be serviced:

1. Chlorine building Equipment to be inspected and serviced, load cells, piping, and regulators,
2. Chlorine contact tank hand-railing to be replaced (if not being done by others).
3. Electric motors and belt drives on irrigation pumps to be replaced with new similar motors and belt drives, the cost of servicing of these pumps to include the procurement of these items.
4. Pumps (Irrigation) and valves to be serviced to OEM standards.
5. Pressure sustaining valve needs to be serviced and set correctly
6. Self-cleaning filter to be serviced to OEM standards.

PSM.12 BABELEGI WWTW SCOPE OF WORKS

The mechanical equipment or installations at the Babelegi WWTW (Refer to As-built Drawing No. E217-C-500) consist of a few new equipment that was never supplied previously, but are additions to the existing plant. The equipment list consists of the following items:

1. Supply and installation of a new sludge diversion gate is required at the Inlet Works to the Old Reactor. Information on this is not clear, the Mechanical Contractor to seek all necessary details before their tender, but indications are that this gate is 600 mm wide.
2. Supply and installation of 2 off new submersible pumps is required at the old reactor. These pumps are expected to provide a flow of 30-40l/s with expected heads of about 6-10m, and are fitted with 7.5kW motors. The pumps can be expected to have similar characteristics to those at Themba WWTW already stated above. The Mechanical Contractor shall confirm the required duty of these pumps before their tender. The pumps are to be installed in a manhole adjacent to the old (currently not used) biological reactor. The Mechanical Contractor shall also assess the pump installation ancillaries already installed for these pumps to check if they are appropriate or relevant to the proposed pumps, or else will need to be replaced with the new pump installation ancillaries.

3. Installation of handrail around pump station is required for safety, (if this is not done by others)
4. Installation of new A-frame hoist would be required to handle the new pumps stated above.
5. As stated above, the supply, installation and commissioning of new mechanical equipment shall be carried out in compliance to the Particular Specification applicable to each relevant item of equipment, as listed above, the Particular Specifications are bound in Volume 2 of these Specifications.

PSM.GSR GENERAL SYSTEM REQUIREMENTS

1. PSM-GSR.1 GENERAL STANDARDS

1. The equipment specified above are minimum requirements expected to be proposed by the tenderers or contractors.
2. Each tenderer shall completed the "Offered" section on the provided mechanical equipment datasheet for the new equipment, such as pumps, to supply information of the proposed equipment for ease of comparison with the suggested equipment information to facilitate checking for compliance, or to provide more information for evaluation of the offer.
3. Consideration shall be given to all proposals submitted that offer more suitable solutions for the expected works while complying to all the requirements in this specification and other additional requirements given by the municipality.
4. Construction drawings for the proposed system shall be based on the as-built drawings, featuring current installations of equipment, or if new, latest layout on site, including location and orientation of installation locations, such as the pump houses, and space reserved for each equipment. Actual required lengths of pipes shall be determined when actual location of equipment is confirmed. Construction drawings, where required, will only be finalized based on approved equipment selection and using construction civil drawings as a basis for their layout design.

2. PSM-GSR.2 GENERAL REQUIREMENTS ON THE PUMPS

1. The contractor shall design and supply pumps that meet the above stated duties, but being able to meet slight variations in expected duties as site conditions may require.
2. The pumps shall be designed to have the highest efficiency, and with a high degree of reliability and durability.
3. Each dry-well pump shall be supplied with a pressure gauge which shall have a measuring scale that enables easy reading of pumping pressure when the pump runs. The maximum reading of the gauge must be such that the duty point pressure does not exceed 75% of the maximum scale reading.

4. Each dry pump shall be powered by electric motors via V-belts and pulleys and allow for setting of required pump speeds.
5. The mechanical contractor shall submit all technical information for the proposed pumps together with completed datasheet for approval prior to ordering the pumps.
6. Selected pumps shall be from local suppliers with sufficient backup service and spares, and with a track record of reliability.

3. PSM-GSR.3 GENERAL REQUIREMENTS ON STEEL PIPEWORK

1. All steel pipework supplied under this Contract is as specified or designed to suit the application and installation location and shall be at least 10 bar rated, and shall be manufactured, corrosion protected, delivered, tested and commissioned in accordance with the General or client Specifications on Pipework and Corrosion Protection.
2. Stainless steel pipework shall be of the grade and specifications as stated in the applicable GA drawings for the equipment or installation.
3. Mild steel pipework of size DN 200 mm or larger shall conform to SANS 719, and shall be of 6mm wall thickness, and shall be corrosion protected to suit the sewage environment, such as Coupon coating and in compliance to the Particular Specification PLQ : Corrosion Protection for Steel Pipes.
4. All connection flanges used shall conform to SANS 1123 Table 1000/1.
 1. Threaded connections shall only be allowed on 25mm and smaller pipework, while larger pipework shall be connected by welding for pump suction pipework and pipework to be buried underground or by flanged connections for pump discharge pipework housed inside the pump house.
 2. Pipework supplied under this Contract shall be complete with elbows, fittings, gaskets, couplings, fasteners and supports, which shall be as per the construction drawing approved by the Engineer.
 3. Care must be taken of the distance of the non-return valve from the pump to prevent excessive wear and inefficiency of the valve.
 4. Care must also be taken of the ratio of the diameter of the pipe reduction of the sump to the pump
 5. All pipes and valves, where required, shall be properly supported by means of suitable corrosion protected supports. Detail of the supports shall be submitted for approval prior to manufacture.
 6. The pipe work shall include for all required puddle flanges where required
 7. Where pipe work connects to equipment such as pumps, the pipework shall be aligned and properly secured into position before the piece of equipment is secured or grouted into position where applicable.

8. The contractor shall fit threaded ½" process connections for pressure gauges on the pump suction and discharge horizontal pipework immediately upstream to the pump entrance and downstream to the pump discharge, before any of the valves. Each pump shall be supplied with its own delivery pressure gauge rated from 0 kPa to 300 kPa or so, shall be of such a size as to enable the reading of pressure from about a 2m distance.

9. The pressure gauges shall each be connected onto the pipework by means of a ball valve, and this shall be installed under the mechanical scope of work

10. All pipework shall be corrosion protected as specified in drawings and as detailed in this specification.

4. PSM-GSR.4 GENERAL REQUIREMENT ON VALVES AND ANCILLARIES

1. All new valves supplied under this Contract shall be as specified or are to match the installed valves being replaced and shall be manufactured and corrosion protected to suit a sewage environment.

2. Only locally supplied valves from established brand manufacturers with local back up spares and service shall be used. The design and supply of new valves shall comply to Particular Specification PLK: "Manufacture and Supply of Valves" as listed above.

3. Details of any new proposed valves shall be submitted for approval prior to placing orders.

4. Installation of the valves shall be as indicated in the approved construction drawings.

5. For the valves whose components (e.g. seals) are to be replaced during servicing, new OEM approved replacement components shall be used.

PSM.PAY MEASUREMENT AND PAYMENT

Quantities specified on the Bill of Quantities, such as pipe lengths at this stage are estimates, but tender pricing shall be based on actual lengths or quantities required for a complete set up of the system to successfully perform the intended functions, as will be supplied by the tenderer. It will be assumed that any tendered price is for the equipment or system as a whole intended to be supplied by the tenderer, and as stated in their tender submissions. It is up to each tenderer to ensure that all the requirements for a fully functional system are included in their tender pricing regardless of whether they have been explicitly stated in these tender document.

PSM.PAY 1 Equipment to be Serviced

The tendered price and payment made for equipment to be serviced shall cover full compensation for the following: -

- Detailed inspection of the installed mechanical equipment to detect any damages, include paint/corrosion protection, checking for completeness of installations and any other anomalies
- Identification of all components, including moving parts that need to be replaced according the Manufacturer's recommendations (due to extended periods of

idleness and/or exposure to the elements). The list may include such things as new bearings, seals, sleeves, gaskets, plastic and rubber components, lubricants, among others.

- Re-installation of all parts requiring mandatory replacement as per manufacturer's instructions
- Other servicing or repairs to the of the equipment, including removing of blockages to pipework, supply of additional fasteners and other ancillaries to carry out minor repairs that can be done on site, and similar activities
- Removal for off-site repairs (where necessary) for some smaller components of the installed equipment that does not constitute a complete refurbishment of the equipment.
- Provision of certain additional items or spares needed to carry out commissioning tests, such as additional v-belts, pressure gauges and other ancillaries.
- Provision of all required lifting and/or handling of installed equipment for in-situ servicing of equipment or components.
- Provision of all required consumables and lubrication supplies, including any required special handling tools required by each equipment or components.
- Re-assembly of equipment that could have been dismantled, making good all affected areas.
- Re-installation of equipment in the plant, if previously removed, including re-connection to pipework and electric control and power supplies.

PSM.PAY 2

Equipment to be Stripped Apart Before Repairs

Some equipment cannot be repaired or serviced before stripping them apart to check the condition of components inside the equipment. The stripping apart of the equipment may involve taking the equipment out of their installation locations, transporting the equipment to a supplier workshop, provision of all tools and labour to take the equipment apart, and thereafter assessing the condition of the equipment and compiling a report to inform the Client of what kind of repair is required of this particular equipment, and providing a rough budget estimate to carry out the repairs or refurbishment. This is necessary for the Client to be able to decide if the repairs or refurbishments are worth carrying out for certain targeted equipment.

The tendered price and payment made shall cover full compensation for all the labour and expenses associated with the above work leading to the submission of the generated report on required refurbishment.

PSM.PAY 3

New Equipment to be Supplied

The tendered price and payment made for equipment to be supplied shall cover full compensation for the following: -

- Detailed design/selection (identification), where needed, of the most suitable equipment or mechanical package plant option to fulfill the specified duty or performance requirements based on all specified design/selection data/information and complying to all provided equipment or package plant specifications as detailed in these documents
- Following Client approval, procurement, performance testing or factory acceptance

testing (FAT) where applicable, supply and delivery to site of the equipment or package plant and installation, where applicable at the target work location (WWT Plant), complete with all pertinent components and all accompanying ancillaries, technical literature and everything else that constitute a fully supplied equipment unit or package plant ready for commissioning.

- All other actions necessary to ensure the supplied equipment complies to all pertinent regulations

PJ11.2 Pump Testing

If Pump Performance Testing is required, a separate payment item will be allowed for in the operations as described in section PJ6 of the Particular Specification PJ: “Refurbishing of Mechanical Equipment” mentioned above.

PJ11.3 Refurbishment of Structural Steel Assemblies and Pipework

Separate items will be included in the schedules for each steel and pipework item to be refurbished, the rates for which must include full compensation for all action as described in Section PJ7 of the Particular Specification PJ: “Refurbishing of Mechanical Equipment” mentioned above. Refer to Payment item PJ11.3 of this Particular Specification.