

Overstrand Municipality

REPLACEMENT OF FILTER MEDIA AT KLEINMOND WATER TREATMENT WORKS

CONTRACT SC 642/2009

REPLACEMENT OF FILTER MEDIA AND FILTER REFURBISHMENT

PTT: DUAL MEDIA RAPID GRAVITY FILTERS

INDEX

Item	Description	Page No
PTT 1	GENERAL SCOPE	1
PTT 2	INTERPRETATIONS	2
PTT 3	MATERIALS	3
PTT 4	PLANT REQUIRED AND DELIVERIES	4
PTT 5	CONSTRUCTION.....	4
PTT 6	CORROSION PROTECTION OF STEEL ELEMENTS	6
PTT 7	INSPECTIONS AND TESTS.....	7
PTT 8	COMMISSIONING AND ACCEPTANCE	7
PTT 9	MEASUREMENT AND PAYMENT	8

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

PTT DUAL MEDIA RAPID GRAVITY FILTERS

PTT 1 GENERAL SCOPE

This Specification deals with the supply, delivery, installation and commissioning of new filter media and ancillary works at the existing Kleinmond Water Treatment Works (WTW). The Contractor will be required to complete all work by 30 June 2009.

The three existing 3.2 x 4.0 m (38.4 m² total) single media rapid gravity sand filters shall be modified to dual media filters by introducing a layer of anthracite above the sand layer thereby increasing the capacity of the filters.

The following tasks shall, amongst others, be executed under this assignment:

- (i) One filter shall be de-commissioned and drained by the Operator of the WTW to allow access to existing media bed;
- (ii) The Contractor shall box out a 1m x 1m section in the corner of the filter bays from the surface of the media to the filter floor to confirm the total depth of media, existing layers and type of filter underdrain system. The Engineer shall inspect this box out, after which the exact new media layer thicknesses shall be confirmed in writing. The Contractor shall subsequently re-fill the box-out and re-commission the filter until the new media has arrived on site.

New media shall only be procured in terms of the layer thicknesses confirmed by the Engineer after the above-mentioned inspection. Volumes stated in the pricing schedule shall be estimates.

- (iii) Once the new media has arrived on site, one filter shall be de-commissioned at a time, drained and cleaned i.e. all media removed up to filter floor level. The condition of the filter floor and nozzles shall be inspected by the Engineer, after which the Contractor shall perform a bubble test to confirm the equal distribution of water and air over the full area of filter. Any/all nozzles shall be replaced at this time.
- (iv) Once the bubble test has been completed successfully, the Contractor shall place the new media at the layer thicknesses instructed by the Engineer.

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- (v) Prior to the placement of the anthracite, the Contractor shall install new epoxy coated 304L stainless steel weir plates to raise the backwash effluent weir level. These weir plates shall be slotted to allow final adjustment during commissioning.
- (vi) Prior to commissioning, the Contractor shall determine the flow rate of the existing backwash pump.
- (vii) Once the media and weir plates have been installed to the satisfaction of the Engineer, each filter shall be re-commissioned by the Contractor.

PTT 2 INTERPRETATIONS

PTT 2.1 Filter Box

The concrete structure housing the filter floors, filter media and wash-out channel as shown on the drawings. Filter boxes have been constructed by others, and comprises of three equal bays, allowing each bay to be backwashed individually.

PTT 2.2 Inlet Box

The concrete structure in the settled water channel which allows the water to enter the filter over a weir.

PTT 2.3 Filter Floor

The filter floor with its under drains, supports the filter media, collects the filtered water and distributes the wash water and air scour.

PTT 2.4 Filter Nozzle

A slotted head secured to a tube designed to screw into a bush or boss cemented to the crown of a lateral pipe or false floor. The nozzle collects the filtered water and also distributes the wash water and air flow in an upward mode through the filter media.

PTT 2.5 Filter Media

The filter media consists of quartzitic pebbles, grit, sand and anthracite (for dual media filters only) placed in layers with a particular grading.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

PTT 2.6 Outlet Box

The concrete or high density polyethylene structure in the filter gallery into which the water passes after filtration.

PTT 3 MATERIALS

PTT 3.1 Selection against Corrosion

In a water treatment plant, the extremely corrosive environment and substances in contact with the materials and equipment require that special attention be given to the selection of materials and equipment capable of withstanding corrosion.

Any material or equipment showing signs of corrosion during the Maintenance Period shall be rejected and will be replaced by the Contractor at his own expense with materials or equipment resistant to corrosion as test proven.

PTT 3.2 Guarantee

All equipment shall be guaranteed against faulty design, materials and workmanship for a period of 12 months from the date of commissioning. During this period the contractor shall rectify, at his own cost, any defects which can be attributed to faulty design, materials and workmanship. Normal wear and tear shall be excluded.

PTT 3.3 Information and Technical Data at Tendering

The Contractor shall provide all technical details associated with the media offered with his quotation. This shall include, amongst others, a full grading analysis of each media type.

PTT 3.4 Filter Boxes

Existing concrete structures.

PTT 3.5 Filter Floor

Existing structures.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

PTT 3.6 Filter Media

Sand media shall consist of clear, hard, equal grain size, quartzitic sand, conforming to the grading analysis is specified under PTT 5.2.

PTT 3.7 Inlet and Backwash Overflow Weirs

The weir plates shall be epoxy coated 304L stainless steel elements bolted to the existing overflow.

PTT 4 PLANT REQUIRED AND DELIVERIES

The Contractor has to supply and maintain suitable tools, plant and equipment so as to be able to perform as per specification.

The Contractor shall be responsible for the off-loading and protection of all material and equipment on site as well as the stacking of such material.

No deliveries will take place on Saturdays, Sundays or statutory non-working days unless special arrangements have been made with and agreed to by the Engineer.

The Contractor shall be solely responsible for obtaining transport permits and clearance from road or rail authorities for the transporting and delivery of materials and equipment as well as the compliance with the requirements of such bodies.

PTT 5 CONSTRUCTION

PTT 5.1 Filter Media

The thickness of the layer as placed, will be measured after placing the layer and covering it with water to obtain the maximum in-situ density.

The Tenderer must provide, with his tender a complete grading analysis of the media offered for each of the layers, as well as particulars of where the different media will be obtained.

Should it be required, 1 kg samples of each of the different types of media offered, must be submitted for approval within 14 days after such request.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

The approved method for placing the filter media to the correct depth, is to mark the filter wall at the specified depth and place the prescribed media up to this mark. Water is then introduced up to this mark and any high or low spots are made good.

The sand and anthracite layers must be placed to a level approximately 10 mm higher than specified; then covered with water. Ten backwash cycles should be carried out, i.e. air scouring, followed by backwashing, in order to bring the finer media particles to the surface. The top layer, with these fines, ± 10 mm thick, must then be removed, leaving the remaining media with the desired grading and depth.

Media shall be dispatched to the site securely contained in bags. After placing the media, excess material shall remain in bags.

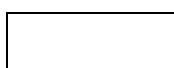
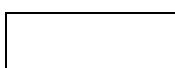
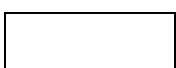
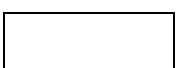
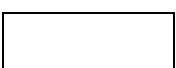
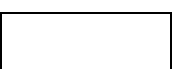
PTT 5.2 Media Specification

Suitable filter media must be offered for the existing filter floor system. Two supporting layers of 150mm pebbles and 100mm grit are normally provided underneath the sand and anthracite layers. The presence and thickness of these layers in the existing filters shall be confirmed by the Contractor during the initial investigation phase.

Filter media specification:	Pebble support layer: 4.0mm – 8.0mm grain size
	Grit support layer: 2.0mm – 4.0mm grain size
	Sand layer: 0.6mm – 1.35mm grain size
	Anthracite layer 1.0mm – 4.0mm grain size

The sand shall have a uniformity coefficient (UC) < 1.4 and an effective size (d_{10}) of approximately 0.7. A limit is placed on the over size and under size fractions, not more than 3% of the mass should pass the 0,6mm sieve and not more than 3% of the mass shall be retained on a 1,35mm sieve. The sand must be clean i.e. have an acid solubility of less than 0,15% and must have a silica content of greater than 98%.

The anthracite filter coal shall adhere to the applicable American AWWA and NSF standards specifically, but not limited to, AWWA Standard B100-1 and NSF Standard 61 approved. The anthracite filter coal shall be obtained from an approved source and shall be clean and free from long, thin or scaly pieces. In addition, the anthracite coal shall be free of iron, sulphides, clay or extraneous dirt.

					
Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

The anthracite shall have a hardness of 3.0 to 3.75 on the MOH scale and shall have a specific gravity of not less than 1.50. The uniformity coefficient (UC) shall be < 1.30 with an effective size (d_{10}) of approximately 2.0. A limit is placed on the over size and under size fractions, not more than 1% of the mass should pass the 1,0mm sieve and not more than 1% of the mass shall be retained on a 4,0mm sieve.

PTT 6 CORROSION PROTECTION OF STEEL ELEMENTS

All projections, sharp edges, layers that have formed and tool marks must be removed from the surface so that the surface is smooth, and it must be cleaned in accordance with sections 2, 3 and 4 of SABS Code of Practice 064 so that it meets the following requirements:

- (a) A grade of cleanliness of at least Sa 2½ when tested by SABS test method 767.
- (b) A surface profile between 50mm and 90mm when tested by SABS test method 772.
- (c) Free from dust and debris to at least 0,2% when tested by SABS test method 769.

Epoxy paint shall comply to SABS 1217 and shall be solvent base epoxy such as Carboline 891 and Sigmaguard EHB, with a minimum dry film thickness of 300 micron.

Epoxy paint and the repair kit for the repair of epoxy shall be from the same manufacturer.

Edges with epoxy paint shall have a radius of 3mm or 50 % of the pipe wall thickness (smaller of two).

The following specification shall be applicable to pipes, specials and fittings to be welded on site:

- In the factory:

Abrasive blast cleaning of complete steel surface to SA 2,5 of ISO 8501-1.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

- On site after welding of joint:

Prepare surface with sand paper or wire brush to St 3 of ISO 8501-1 to produce a white metal surface.

Apply epoxy repair kit from to same manufacturer as the factory applied epoxy.

The area applied on site shall be tested for pinholes and thickness.

Corrosion protection and painting shall not be measured separately. The price for corrosion protection and painting shall be deemed to be included in the price for the pipe, fitting or special.

PTT 7 INSPECTIONS AND TESTS

The Contractor shall prepare a 1m x 1m box-out of the existing filter media to confirm the current media depth, layer thickness and configuration of the filter underdrain system. Only one box-out shall be prepared and will be inspected by the Engineer.

Once a filter bay has been cleaned, washwater and air will be pumped through the filter floor and nozzles and special attention will be given to air distribution by individual nozzles.

PTT 8 COMMISSIONING AND ACCEPTANCE

Acceptance of each filter bay shall constitute the following:

- Bubble test to confirm functionality of underfloor system;
- Placement of support layers and sand layer followed by 10 backwash cycles to bring finer particles to surface. Removal of fine particles ($\pm 10\text{mm}$) and top up to required depth.
- Placement of anthracite followed by 10 backwash cycles to remove finer particles and top up.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

PTT 9 MEASUREMENT AND PAYMENT

PTT 9.1 SUPPLY AND DELIVERY TO SITE

PTT 9.1.1 *Backwash overflow weirs*

Shall be priced as a lump sum per filter bay.

The rate shall include for the manufacturing, corrosion protection and delivery to site of all materials required for the installation, including fasteners.

The weir length per bay is approximately 4.0m (12m total).

PTT 9.1.2 *Filter Media*

Shall be measured per media type and per m³ supplied.

PTT 9.2 INSTALLATION

The following items shall include taking delivery of materials on site, handling, safeguarding, installing, painting, fixing, grouting and aligning.

PTT 9.2.1 *Backwash overflow weirs*

PTT 9.2.2 *Filter media*

Shall be measured per media type and per m³ placed.

The rate for filter media shall include for covering with water and removal of the 10 mm fines in accordance with PTT 5.1.

PTT 9.3 ANCILLARY WORKS

PTT 9.3.1 Refurbish backwash pump and blower

The scope of works under this item is unknown at tender stage and a provisional sum of R 20,000 has been included in the tender amount.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

PTT 9.3.2 Box out of existing media

The Contractor shall provide a lump sum rate for the preparation of a 1m x 1m box-out of the existing media from the top of the media to the filter floor.

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Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2