Eskom	Scope Of Work	Generation

Title: **Kriel Power Station Pre-treatment Plant Refurbishment Scope Of Work**

Unique Identifier:	**EAP0357**
Alternative Reference Number:	**N/A**
Area of Applicability:	**Engineering**
Documentation Type:	**Scope of Work**
Revision:	**1**
Total Pages:	**32**
Next Review Date:	**N/A**
Disclosure Classification:	**CONTROLLED DISCLOSURE**

Compiled by	Functional Responsibility	Authorised by
.....	.....	..... pp
J. Pillay	**N Muthavhine**	**R Nelwamundo**
System Engineer	**Auxiliary Engineering Manager**	**Engineering Manager**
Date: 2022-08-24	Date: 2022/08/26	Date: 30.08.2022

CONTENTS

TABLES

1. INTRODUCTION

Kriel Power Station (PS) treats Usuthu Scheme raw water at the Water Treatment Plant (WTP) to produce demineralised water used as boiler feed water. The water passes through a Water Pre-treatment Plant (WPTP) that removes suspended solids and organics. The WPTP mainly consists of three (3) clarifiers, twelve (12) sandfilters, three (3) backwash pumps, two (2) post backwash pumps, three (3) air scour blowers and one (1) flash mixer chamber. The clarifiers operate in parallel that act to remove suspended solids and the larger organic carbons and the expected outlet turbidity from the clarifiers is 1 NTU. There are sandfilters that act to remove the finer particles and the expected outlet turbidity is 0.2 NTU.

The WPTP has not been refurbished for the entirety of the station life. Due to age of the plant, corrosion, the integrity of the pipes and structures and the condition of the valves, the plant's reliability and efficiency has been compromised.

2. SUPPORTING CLAUSES

2.1 SCOPE

This document covers the scope of work (SOW) for the refurbishment of the WPTP that consists of the following main systems:

- Pre-treatment Clarifiers
- Sandfilters
- Backwash System

2.1.1 PURPOSE

The purpose of the document is to provide technical governance in terms of a SOW for all *Works* that need to be executed to replace the pipes and valves associated with the WPTP as well as the refurbishment of twelve (12) sandfilters and two (2) clarifiers.

2.1.2 APPLICABILITY

This document is applicable to Kriel Power Station: Auxiliary Plant Engineering, Chemical Services Department and Mechanical Maintenance Department (MMD).

2.2 NORMATIVE/INFORMATIVE REFERENCES

2.2.1 NORMATIVE

[1] ISO 9001 Quality Management Systems

[2] Site Specific plant maintenance manuals

[3] Power Station Maintenance Strategies

[4] 240-48929482 – Tender Engineering Evaluation Procedure

[5] 32-391 - Eskom Integrated Risk Management Procedure

[6] QM-58 Supplier Contract Quality Requirements Specification

[7] 32-727 - Safety, Health, Environment and Quality (SHEQ) Policy

[8] 240-53113712 - Chemistry Standard for the Pre-treatment and Production Processes of Demineralised Water

[9] 240-55864764 - Chemistry for Potable Water Standard

[10] 240-53113712 – Demineralisation Water Production using Ion exchange resins Chemistry Standard.

[11] GAM.MAT.22.104 - Kriel PS Corrosion Protection for Raw and CW Clarifiers

[12] GAM.MAT.22.105 - Kriel PS Raw and CW Piping Galvanising Corrosion Specification

[13] GAM.MAT.22.106 - Kriel PS Raw and CW Piping Coating Corrosion

[14] 240-106365693 – Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coating

[15] 240-101712128 – Standard for the Internal Corrosion Protection of Water Systems, Chemical Tanks and Vessels and Associated Piping with linings

[16] 34-1168 – Colour coding, symbolic safety signs and demarcation

[17] 240-105020315 - Standard for Low Pressure Valves

[18] 240-123801640 - Standard for Low Pressure Pipelines

[19] SANS 1200 - Standardised specification for civil engineering construction

[20] 240-56364545- Structural Design and Engineering Standards

[21] 240 – 106628253 Standard for Welding Requirements on Eskom Plant

[22] 240-83539994 Eskom NDT Personnel Approval for Quality Related special processes on Eskom Plant standard

[23] 240-83540088 Requirements for NDT on Eskom Plant Standard

[24] Applicable P&ID's:

Drawing Number	Description
28.45/33453-s0-r2	Filtered Water System
28.45/33488	Raw water supply system
28.45/33458	Demineralised Filter/Backwash/Post Backwash/Terrace/Filtered water pumps
28.45/33445	Clarifiers and Sandfilters
0.45-3572-001-R05	Rapid Gravity Filters - Sandfilter Concrete Details & Sections
0.45-3571-001-R08	Rapid Gravity Filters - G.A. and Details
0.45-3375-001-R04	Rapid Gravity Filters - False Floor Layout
0.45-3572-003-R01	Rapid Gravity Filters - Knife Gate Valve at Filter Inlet
0.45-4417-001-R01	Rapid Gravity Filters - Precast Filter Panel
0.45-3572-002-R01	Rapid Gravity Filters - Filter Outlet Backwash & Scour Pipe Work

2.2.2 INFORMATIVE

[25] 36-2 – Documents and Records Management Procedure.

[26] 240-86973501 - Engineering Drawing Standard – Common Requirements

[27] 240-56063805 - LV Power and Control Cable with Rated Voltage Standard

[28] 240-56227443 - Requirements for Power and Control Cables for Power Stations

[29] 240-56227516 - Specification for switchboard and associated equipment for voltages up to and including 1000 V ac and 1500 V dc

[30] 240-56227589 - List Of Approved Electronic Devices To Be Used On Eskom Power Stations

[31] 240-56356396 - Earthing and Lightning Protection Standard

[32] 240-56357424 - MV And LV Switchgear Standard

[33] 240-56357518 - Power Station Electric Motors Procurement Standard

[34] 240-56360387 - Storage of Power Station Electric Motors Standard

[35] 240-56361435 - Transportation of Power Station Electric Motors Standard

[36] 240-57617975 - Procurement of Power Station Low Voltage Motors Specification

[37] 240-55714363 - Coal Fired Power Station Lighting and Small Power Installation Standard

[38] 240-56227426 - Management of Power Station MV and LV Protection and Settings Standard

[39] 240-64430501 - Low Voltage Variable Speed Drive Control Equipment Standard

[40] 240-57617975 - Procurement of Power Station Low Voltage Motors Specification

[41] 240-56357421 - Measurements and Metering Standard

[42] 240-56355754 - Field Instrument Installation Standard

[43] 240-56356530 - Environmental Conditions for Process Control Electronic Equipment & Components used at Power Stations Manual

[44] 240-56355731- Environmental Conditions for Process Control Equipment used at Power Stations Standard

[45] 240-56355729 - Plant Control Modes Guideline

[46] 240-56355815 - Field Instrument Installation Standard: Junction Boxes and Cable Terminations

[47] 240-56355843 - Field Instrument Installation Standard: Pressure Measurement Systems

2.3 DEFINITIONS

2.3.1 DISCLOSURE CLASSIFICATION

Controlled Disclosure: Controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviations	Description
AKZ	Anlagen Kenn Zeichnungs
BOQ	Bill of Quantities
C&I	Control and Instrumentation
CAD	Computer Aided Design
HD	Holding down
HDPE	High Density Polyethylene
FWT	Filtered Water Tanks
KGV	Knife gate valves
NB	Nominal Bore
NDT	Non-Destructive Testing
NRV	Non-return valve
OHSA	Occupational Health and Safety Act
P	Pressure
P&ID's	Piping and Instrumentation Diagrams
PFD	Process Flow Diagram

pH	Potential hydrogen
PPE	Personal Protective Equipment
PTW	Permit To Work
PWT	Potable Water Tank
Q	Flow rate
QA	Quality Assurance
QC	Quality Control
QCP	Quality control program/plan/procedure
QCP	Quality Control Procedure
RO	Reverse Osmosis
SE	System engineer
SHE	Safety, Health & Environmental
SHEQ	Occupational Safety, Health, Environmental, and Quality
SOW	Scope of work
TOC	Total organic chemistry
WPTP	Water Pre-treatment plant
Unit	**Description**
h	Hour
m	Metre
mm	Millimetre

2.5 ROLES AND RESPONSIBILITIES

Roles and responsibilities are as follows:

2.5.1 SYSTEM ENGINEER

- Will be required to use this document as the basis to compile their refurbishment SoW for scheduled planned maintenance.
- Must ensure that all required disciplines and subject matter experts are consulted for their input into both the SoW and for the inspections.
- Will be responsible to obtain the applicable design documentation required for the compilation of the SoW.
- Is responsible for the development of a spares list which captures all the required and necessary spares to do maintenance as required.
- Is responsible for reviewing, editing and accepting the quality control plan (QCP). The SE will indicate the hold points required and will sign off on these hold points. If the system engineer is not competent to sign off on certain hold points, then it is his/her responsibility to find a competent person to sign off those hold points.
- Is responsible to clearly stipulate the returnables within the tender contract strategy if the work is outsourced i.e. Method statements, Non Destructive Testing (NDT) requirements etc.

2.5.2 PROJECT MANAGER

- It is the responsibility of the project manager to ensure that a contract is put in place and is managed well. He/she must also obtain the QCP's and other relevant documents from the *Contractor* for acceptance by the system engineer.

2.6 PROCESS FOR MONITORING

The QCP will be a method to monitor the work conducted by the *Contractor*. The QCP supplied by the *Contractor*, will be reviewed and discussed with WTP SE prior to SOW execution to allow the necessary hold/witness/verify points to be included to ensure quality work throughout.

3. THE *WORKS*

The *Works* is inclusive of all activities necessary for the refurbishment of the WPTP. The replacement of the valves and pipes will be a like-for-like replacement unless otherwise stated.

3.1 BACKGROUND

Some of the WPTP valves are passing and the pipes are leaking. The sandfilter sand is old and fouled with organic particles. The inlet and outlet valves for the sandfilter are passing meaning isolating the sandfilters for maintenance is difficult and the periodic sand disinfections cannot be executed. The float valves on the sandfilter no longer work so the sandfilter level is not controlled. This leads to overflow and water loss as well as underflow and sand exposure. The coating on the clarifier interior has degraded and patching on the walls needs to be done. The clarifier bridge drive wheel has damaged the concrete on its track. There is significant screed exposure on all concrete surfaces exposed to water. The bridge drive is old and tends to slip which damages the concrete track. The bridge centre stirrer drive is also old and prone to failure.

3.2 DESCRIPTION OF THE *WORKS*

The *Contractor* must refurbish and replace all components as per the SOW.

The *Contractor* shall perform an inspection of all items mentioned in this SOW, and shall submit an inspection report to the WTP SE for approval prior to carrying out any work.

The *Contractor* shall provide engineering with a method statement and QCP prior to any work execution. The engineer should review and edit QCP where applicable with additional points and the identification of the hold and witness points. The edited QCP to be accepted by all parties and to be used as the working document to track the quality of work throughout the execution of the scope.

The *Contractor* shall also refurbish the civil structure of the sand filter and channels, where applicable, associated with the sand filter, which includes the backwash system as per the works below.

3.2.1 SCOPE

The *Contractor* is to inspect, supply, install and commission the scope in the following sections.

3.2.2 BATTERY LIMITS

- The first set of battery limits for this SoW is from the raw water supply system inlet to the clarifier (700 NB pipeline) until the sandfilter inlet channel, which includes all equipment, pipework and valves related within the battery limits. Only the actually injection of the coagulant and flocculant points are also included in these battery limits.
- The second set of battery limits is from each individual sand filter inlet until the individual sand filter outlet (including the clearwell inside the WTP building) which includes all equipment, pipework and valves related within the battery limits.
- This SoW includes the equipment, valves and piping for the backwash and post backwash section.

3.2.3 GENERAL REQUIREMENTS OF THE WORKS:

1. Due to the plant requiring being in service during the refurbishment, the *Contractor* needs to write a method statement for submission to the Project Manager indicating the sections that they will begin refurbishing, in order to allow the station to continue with its normal WTP processes.
2. The *Contractor* needs to perform an inspection of all Pre-treatment Plant items included in this SOW and indicate the condition of items inspected. The inspections shall be documented in a report and submitted to the Project Manager for approval prior to any refurbishment activity being carried out.
3. Any replacements that are required after inspection as part of this scope shall be communicated to the Project Manager for acceptance prior to replacement.
4. For the Clarifier:
    - The clarifier must be drained of all water
    - The sludge must be removed by the *Contractor*
    - The scraper bridge must be inspected and replaced/repaired as necessary
    - The scraper bridge drive must be inspected and replaced/repaired as necessary
    - The centre stirrer must be inspected and replaced as necessary
    - All motors necessary for the operation of the clarifiers must be inspected and replaced/repaired as necessary
    - Perform NDTs (thickness measurements) on piping and replace if integrity of piping is compromised.
    - All valves and piping associated with the clarifier must be inspected and replaced if applicable
    - Damage to the civil structures must be repaired
5. For the sandfilter:
    - The individual sandfilters must be drained of water
    - Sand must be removed without damaging the sandfilters further.
    - All nozzles must be removed.
    - Remove and replace precast panels with all associated holding down bolts and chemical anchors
    - Inspect and repair damaged concrete structures of sandfilter
    - Inspect and repair damaged concrete structures of backwash channels
    - Perform NDTs (thickness measurements) on all piping associated with the sandfilter and the clearwell and replace as necessary
    - Perform NDTs (thickness measurements) on all piping associated with the backwash and post backwash piping, and replace as necessary
    - All valves, pumps, blowers and piping associated with the sandfilters and backwash and post backwash must be inspected and replaced if applicable
6. Any pipes found on the plant that differ from the grades, materials and pressure classes stated in the SOW are to be brought to the attention of the WTP engineer. The *Contractor* is to replace these pipes with those in this specification.

7. Commissioning of the entire system.
8. Include a performance guarantee (leak testing) of piping and valves ensuring that it is leak tight and repair all defects if the pressure tests do not pass for all piping and valves.
9. Include a performance guarantee (flow rate and turbidities) for the operation of the WPTP.
10. Include a performance guarantee for the backwash and air scouring.
11. Supply all equipment necessary for installation and leak testing i.e. rigging etc.
12. For all replacements, the existing valve/pipe/instrument shall be scrapped using Kriel PS scrapyard.
13. All manufacturing will adhere to the standards as specified in this document.
14. The *Contractor* will determine all specifications not given.
15. The *Contractor* shall take on site measurements for installation of the equipment of the system and produce complete workshop drawings for fabrication and installation.
16. The *Contractor* submits quality assurance documents such as quality control procedures, product data sheets and method statements to the Employer to request witness, hold and review points as is necessary and the *Contractor* accommodates inspections that will be done by the *Employer* in his project schedule.
17. The *Contractor* is to supply full service and operations manuals to the *Project Manager* for all items replaced refurbished.
18. The *Contractor* must apply the standards listed in this document as well as any other standards or legislation not specifically mentioned that might be relevant.
19. The *Contractor* must accommodate that a design review will be conducted with the *Employer* before any construction occurs.
20. The *Employer* shall conduct a final inspection of the installed system prior to its commissioning in order to render it safe for use and issue a certificate to the *Contractor* to commence commissioning.
21. The *Contractor* shall ensure a safe working environment and that all work practices comply with Eskom's SHEQ requirements 32-727 - Safety, Health, Environment and Quality (SHEQ) Policy.
22. The *Contractor* submits a detailed method statement for the installation prior the installation for approval by the employer. The Method Statement explains in sufficient detail the following:
    - Information of the activities being performed by other *Contractors*.
    - Details of products to be used and how it will be applied which should be in accordance to the product supplier requirements
    - Provide test certificates that indicate properties of materials required.
    - Explanation of the sequence/order of work areas. The information to be detailed by narrative and to be indicated on drawings.
    - QCP

3.3 SANDFILTER SCOPE OF WORK

3.3.1 OVERALL REQUIREMENTS

The *Contractor* shall:

1. Remove sand and temporarily store the sand in 1 ton sacks in a designated area at the WTP.

2. The sand removal must be done in such a way that it will not cause any damage to the civil structures, corrosion protection coating and other components in the sand filters. A method statement must be supplied and accepted by the SE.
3. Remove nozzles.
4. Remove old hold down bolts and support plates.
5. Remove precast panels. The *Contractor* must install his own lifting mechanism i.e. crawler and chain hoist if no overhead lifting mechanism is available on site.
6. Repair panels.
7. Clean and remove all traces of existing sealants, galvanised metal straps and bitumen as per the surface preparations specified by the product supplier on all precast panels in all the sand filters
8. Remove sand under the sand filters panels.
9. Supply and install hold down bolts and nuts which support the concrete beams of the sand filter. Also supply and install support plates. The hold down bolts are to be drilled into the floor of the sand filter and chemically anchored.
10. Supply and install new hold down bolts and nuts on sand filter of the same materials of construction as per original design. Also supply and install support square plates of the same materials of construction as per original design for the hold down bolts. The bolts are used to hold the panels in position. The bolts must be drilled onto the concrete beam and chemically anchored.
11. Supply and Install new nozzle sleeves for casting into the concrete panels.
12. Install all the panels of the filter slab.
13. Supply and install strips of the same materials of construction as per original design.
14. Position the strips; apply an acceptable sealer seal strip along each panel edge.
15. After application of the sealant, fill up the remaining void with an acceptable filler or grout.
16. Supply and install new system which can be used to seal the area around perimeter of the sand filter.
17. Install the nozzles supplied by the *Employer*.
18. Put back the sand removed by the *Employer* in sand filter.
19. All valves and piping should be inspected and replaced where applicable.
20. All pumps and motors should be inspected and replaced where applicable.
21. Refer to the appendices for a list of all valves, piping, pumps and motors.
22. Dispose of all the waste and provide the Environmental department with a waste manifest/disposal certificate
23. The *Employer* will ensure that scaffolding is erected for the job. The *Contractor* must give a notification of at least 72 hours for the required scaffolding.
24. The *Contractor* shall ensure that all the equipment removed for the purpose of replacement (e.g. Nuts, Bolts etc.) is put back.
25. The *Contractor* shall be responsible to verify with the *Project Manager* in the case of any uncertainties during the proceedings of the project.

3.3.2 FILTER DESIGN SPECIFICATIONS

The design specification of the sandfilters is provided in Table A below.

Table 1: Pre-treatment Specification

(False Floor Filter System; Constant Head Rapid Gravity; 100 mm Pre-Cast Concrete Panels, Nozzles Type KSH Type S1)

All valves included are to be PN16 rated. Valve are to comply with [17]. Pipelines and flanges are to comply with [18]. All information is to be verified by the *Contractor*. All valves and piping are to be corrosion protected as per [11] to [15]. The *Contractor* is to verify the pipe and valve sizes on the plant, as well as clarifier bridge and centre stirrer drive motors.

Component	Unit	Qty	Remarks
Filter specifications			
Total number filter compartments	no.	12	
Pre-cast Panels per filter	no.	15	
One filter compartment area	m^2	37.13	
Plant filter area	m^2	445.50	
Sand Filter Water Inlet Valves	-	12	250 NB Manual Cast Iron Check/Flap Valve PN16
Sand Filter Water Outlet Valves	-	12	200 NB Cast Iron Manual Gate Valve (Flanged) Face to Face = 320mm PN16
Sand Filter Inlet Launder Sectional Valves	-	2	Mild Steel Manual Channel Gate Valve [600 W x 1000 H] PN16
Sand Filter Float Valve	-	12	200 NB Cast Iron Disk-Type Float Valve (Flanged) Face to Face = 290mm PN16

Component	Unit	Qty	Remarks
Sand Filter Outlet Sample Valves	-	12	25 NB Manual Ball Valve PN16
Sand Filter Outlet Turbidity Sample Valves	-	12	25 NB Manual Ball Valve PN16
Filter cell dimensions			
Length	m	8.25	
Width	m	4.50	
Total Filter Depth	m	2.12	
Backwash Channels			
Length	m	8.25	
Width	m	0.6	
Height	m	1.21	
Loading rates			
Flow rate per filter	m^3/h	67	
Filter loading rate	m/h	1.8	
Maximum head on filters (to scour overflow)	m	1.22	
Backwash rates			
Backwash procedure	-	-	Sequential (air scour followed by water backwash
Design air rate**	m/h	45	
Design backwash rate**	m/h	18.8	
Air scour blowers			
Total numbers**	-	3	
Number standby**	-	1	

Component	Unit	Qty	Remarks
Flow capacity per blower**	m^3/h	1634	
Backwash pumps & valves			
Backwash Pumps	-	2	
Post Backwash Pumps	-	2	
Backwash Piping**	m	240	DN 300 mm
Post Backwash Piping**	m	240	DN 200 mm
Number standby**	-	1	
Flow capacity per backwash pump**	m^3/h	745	
Head per backwash pump	m	10.5	
Backwash valves number	-	12	300 NB Cast Iron Manual Gate Valve (Flanged) Face to Face = 400mm PN16
Post Backwash valves number	-	12	200 NB Cast Iron Manual Gate Valve (Flanged) Face to face = 320mm PN16
Raw Water/Clarifier			
Raw water pipeline to Clarifier flash mixer	m	60	400 NB
Raw water tap-off to pre-treatment Plant (until reducer)	m	150	700 NB
Raw Water to Strainer Isolation valves	-	3	400 NB Cast Iron Manual Gate Valve (Flanged) Face to face = 470mm PN16

Component	Unit	Qty	Remarks
Clarifier Launder Drain Valve	-	4	150 NB Cast Iron Manual Gate Valve (Flanged) Face To Face = 280mm PN16
Clarifier Inlet Isolation Valve	-	3	400 NB Cast Iron Manual Gate Valve (Flanged) Face To Face = 470mm PN16
Clarifier Small Blowdown Valve	-	6	25 NB Manual ball hand valve PN16
Clarifier Blowdown Valves	-	3	250 NB Cast Iron Manual Gate Valve (Flanged) Face To Face = 280mm PN16
Flash Mixer Inlet Isolation valves	-	1	400 NB Manual Butterfly valve Face to Face = 100mm PN16
Flash Mixer Inlet Control valves	-	1	400 NB Pneumatic Butterfly valve Face to Face = 100mm PN16
Coagulant Dosing Point Isolation valve (Located at the start of tap off to pre-treatment plant)		2	25 NB Manual ball hand valve PN16
Flocculant Dosing Point Isolation Valve (Located at ground level prior to flash mixer chamber)		2	25 NB Manual ball hand valve PN16
Streaming Current Sample Point Valve (Located after strainer isolation valves)		1	25 NB Manual ball hand valve

Component	Unit	Qty	Remarks
			PN16

3.3.2.1 FILTER INLET

The filter inlet consists of an inlet check-valve and a strainer/spreader cage.

3.3.2.1.1 Inlet Check-Valve

The purpose of the inlet check-valve (Photo A) is to close the inlet preventing water flowing backward into the supply channel during backwash or to close flow into the sand filter compartment for repairs. Shutting-off supply to the filter compartment is via an existing valve equipped with a hand wheel mounted on a pedestal at the access walkway. The existing inlet check-valves are tailor-made but are not functioning properly. The valves must be replaced with knife gate valves. Refer to Dwg. 0.45-3572-003-01 Knife gate valves (KGV) have a short face to face dimension which will make it a convenient option to install as space for a valve at the entrance to the filter compartment is at a premium. The KGV must be equipped with a hand wheel similar to the existing valve mounted on a pedestal at walkway level. The spindle of the knife gate valve must be extended with a 40mm diameter galvanised steel pipe for the valve to be operated from a pedestal at walkway level. The extension spindle must be supported by at least one intermediate bracket anchored to the concrete wall. The existing handrail must be adjusted so that the hand wheel can be operated without the handrail interfering with its functioning.

		
Photo A: Existing inlet check-valve	Photo B: Extension spindle to pedestal at walkway level	Photo C: Hand-wheel on a pedestal mounted on the walkway

3.3.2.1.2 Strainer and Spreader Cage

The existing strainer and spreader cage serves as an energy dissipater and is responsible for breaking the speed of water into the filter compartment thereby preventing sand from being washed away and disturbing the thickness of the filter media. The existing strainer and spreader cage should be replaced and corrosion protected as per [14] and [15]. Refer to the thickness of media layers on Dwg. 0.45-3572-003-R01.

3.3.2.1.3 False floor underdrain system and pre-cast concrete panels

The false floor of a filter underdrain is used, together with nozzles, to retain the sand filter media. This type of underdrain allows the open space under the floor to act as a collection area for the filtered water and distribution of the backwash water and air scour. Dwg. 0.45-3375-001-04 provide details of the layout of the existing filter compartment as well as details of the concrete panels and HD bolt positions.

3.3.2.2 Removal/Installation of False Floor and Pre-cast Concrete Panels

(a) Remove filter sand (23m^3 per filter) and temporarily store in 1000 m^3 bags in designated areas close to WPTP;

(b) The sand removal must be done in such a way that it will not cause any damage to the civil structures, corrosion protection coating and other components in the sand filters.

(c) Remove the pre-cast concrete panels (15 per filter). The *Contractor* must use his own lifting equipment or crane for this;

(d) Cut-off heads of vertically installed holding down (HD) bolts (48 per filter) which is anchored in beams supporting the pre-cast panels, and dispose of bolts together with the anchor plates as instructed by the Project Manager.

(e) Cut-off heads of horizontally installed HD bolts (40 per filter) which is anchored in walls, and dispose of together with anchor brackets as instructed by the Project Manager.

(f) The precast filter panels must be replaced with new panels manufactured from the template drawing (Dwg. 45-4417-001-02).

(g) Clean and remove all traces of joint sealant, galvanized metal straps and bitumen on all surfaces especially on false floor beams. (NB - also remove old combiflex).

(h) Remove all sand that has accumulated below the sand filter panels and clean the floor surfaces.

(i) Supply and install in a vertical position M20 x 250 mm long SS 316 HD bolts (88 per filter) including stainless steel nuts and washers. The bolts should be anchored into the concrete beams with chemical anchors. Refer to the Sections through the Filter Floor Layout on Dwg. 0.45-3375-001-R04 for details and HD bolt positions.

(j) Supply and install in a horizontal position M20 x 250 mm long SS 316 HD bolts (62 per filter). The bolts should be anchored into the walls with chemical anchors. Refer to the Sections through the Filter Floor Layout on Dwg. 0.45-3375-001-R04 for the positions of the HD Bolts.

(k) Supply and install new nozzle sleeves for casting into the concrete panels.

(l) Install pre-cast concrete panels (15 per filter) on the supporting beams in the underdrain compartment. Refer to the pre-cast concrete panel installation procedure in 3.3.2.2.

(m) Supply and install anchor plates 100mm x 100mm x 10mm SS 316 (88 per filter) including stainless steel nuts and washers.

(n) Supply and install 100mm x 75mm x 10mm SS 316 brackets to hold down the edges of the panels including stainless steel nuts and washers.

(o) Position the pre-cast concrete panels (refer to Refer to Sections on Dwg. 0.45-3375-001-R04) and apply permanently elastic, non-sag, polyurethane joint sealant to seal strip along each panel edge.

(p) After application of the sealant, fill the remaining void with a free flowing, low shrinkage expanding cementitious grout with good bonding properties as indicated.

(q) Supply and install a new strip a high performance joint sealing system for construction joints, expansion (movement) joints and connection joints around perimeter of the sand filters (51m x 75mm x 100 mm).

3.3.2.3 Installation of Filter Floors Panels

(a) Bearing Surface Preparation

Ensure all bearing surfaces are clean and level. A level check across all supporting beams should be carried out to establish the high point and the deviation between high and low points. If necessary the levels on all beams should be leveled with an epoxy mortar.

(b) Installation

Remove protection caps from threaded inserts in the plastic filter nozzles; wipe any grout residue from threads.

Seat panels squarely, level and with a minimum bearing of 35mm per side on concrete beam with a gap of 25mm between panels. Bearing should be equal on all panels. It is recommended the starting point be one corner of the filter, taking into consideration the reference to the highest datum point. It may be helpful at this stage to fit the four corner nozzle sleeves into the panel; the top of these can be used as a leveling reference.

Pack panels at four corners and mid point on bearing surface to correct level, using stainless steel or approved plastic shims. Lift panel and apply sealant / adhesive in a continuous bead along bearing surface. It is recommended a double bead of sealant is applied on this surface or more if gaps require it. Lower the floor panels onto the bedding and onto sealant and shims.

Note: A sealant adhesive is recommended.
Butt-up the next adjacent panel and repeat the above installation, this time also sealing the joint between the panels, this joint may be sealed directly to the upper surface.

Continue process until all joints are sealed.

Re-check level of sleeves across floor.

If the shutter system has been setup properly, few, if any, leveling washers will be required to achieve a finished nozzle floor to within approximately a 2mm deviation.

(c) Pressure Testing

Ensure that filter cell and plenum chamber is clean. Raise water level, either via backwash pumps or filling from external supply from above the filter floor. When water level first appears through threaded nozzle inserts in concrete floor, turn off supply. Fit all polypropylene sealing plugs and "O" rings, tightening to approx. 12-15Nm. Apply an upward pressure of 0.75bar, by a suitable means, using water. Maintain test for 30 minutes, tightening any sealing plugs that may show minor seepage.

(d) Air Scour Testing

Air scour tests are an essential part of proving the filters mechanical performance, all filters should be tested. Ensure filter cells, above and below suspended floor, are completely clean, flush through if required.

Install and level, if required, all filter nozzles, as in 3.3.2.3 (b). Tighten all nozzles to approximately 8Nm. Raise the water level until there is approximately 150mm of cover over the filter nozzle heads. Apply air, at the correct volume, preferably by means of the design blower. After an initial settling period an even pattern of bubbles should be seen across the filter. This pattern should be viewed for no more than 45-60 seconds. After this period it is possible abnormalities in the pattern may occur, this is not unusual and will be cured by re-starting the test. These small abnormalities are

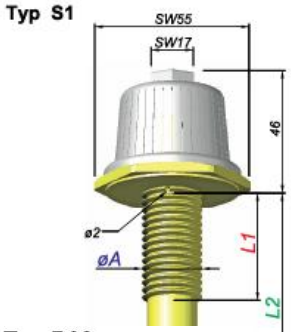
caused by the small head of the water above the filter floor and will never be produced when the filters have a full head of media and water in place.

3.3.2.4 Filter Nozzles and sleeve

Filter Nozzles (which are Eskom stock items) are KSH Type S1 with the following specification (Refer to the sketch below):

Table 2: Filter Nozzle Specifications

Type	Slots (white)	Thread (øA)	Thread Length (L1)	Shaft L2	Shaft outside diameter (øB)
S1	36 x 0.35mm ($265mm^2$)	33mm	20mm	245mm	19mm

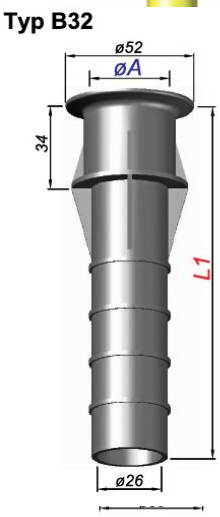


There are 1650 nozzles per sand filter, arranged in 11 rows of 10 nozzles per pre-cast panel, with a total of 15 pre-cast panels per filter compartment. Refer to Dwg. 0.45-4417-0011-02 for details of the layout pattern of the nozzles.

Filter Sleeves for casting into concrete floors are KSH Type B32, and must be supplied by the *Contractor*, with the following specification (Refer to the sketch below):

Table 3: Filter Sleeve Specifications

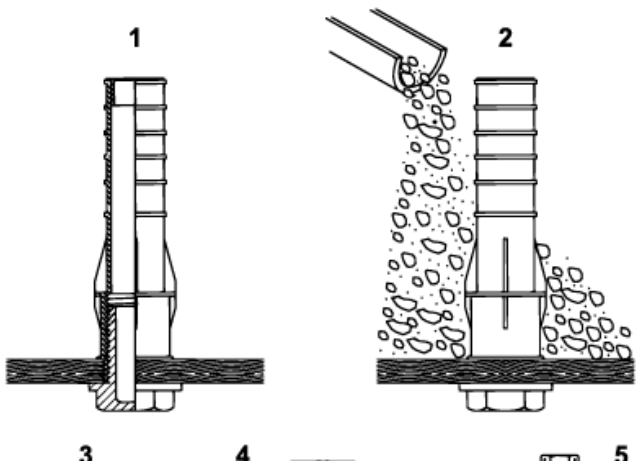
Type	Thread (øA)	Thread Length (L2)	Shaft L1
B32	33mm	20mm	100mm



Additional items that must be supplied by the *Contractor* are the following (Refer to the installation sketch for the purpose of these items):

- Steel plate = 6 mm

<u>Sketch A:</u> Procedure for installing Nozzle Sleeves



3.3.2.5 Repairing Concrete floor, walls and false floor beams

3.3.2.5.1 Repair Mortar Surface Priming

Aggregate must be exposed where it is not already exposed. All concrete substrate must be sound, clean and free from oils, grease or surface contaminants. All loose materials and surface laitance must be removed by high pressure water jet blasting or similar mechanical means. Small areas and 'spot' repairs should be mechanically prepared by needle gunning, bush hammering or similar means.

Thoroughly wet the prepared surfaces to a saturated condition, making sure there is no standing water. After saturation prime the surfaces with an approved surface bonding primer). Exposed steel reinforcement should be grit blasted to a bright steel condition to remove all traces of rust and contamination prior to the applying surface primer.

3.3.2.5.2 Repair Mortar

Use a trowel or spatula to apply a high build cementitious, polymer modified, repair and reprofiling mortar containing silica fume and corrosion inhibitor. (wet-on-wet without any voids, to the primed surfaces. The mortar must be applied strictly in accordance with the product supplier instructions.

3.3.2.6 Float valve and outlet control valve

Remove existing float control valve and supply and install a new modulating float valve to maintain a constant water level in the sand filter compartment by compensating for variations in supply and control the flow out of the filter compartment by opening on a rising water level and closing on a drop in level. Shutting-off the flow supply through the control valve should be via a solenoid valve with a switch mounted inside the filter building next to the shut-off, air and scour valves.

3.3.2.7 Pipe work replacement

Water backwash pipe work on the outlet from the sand filter has been replaced by a temporary backwash pipe and some pipe work has been abandoned. The problem is that there is no scour pipe in the pipe gallery and because pipes are continuously under water this has caused the pipe work to corrode severely. All the pipe work must be removed and replaced by new pipes. The temporary water backwash will be relocated and used as temporary water backwash for the replacement of the second set of filters once the first set of filters have been refurbished. Refer to Dwg No. 0.45-3572-002-00 for details of the pipe work that needs to be replaced. Refer to appendices for the list of piping. Corrosion protection must be performed according to [14] and [15].

3.3.2.8 Filter Sand

3.3.2.8.1 Filter Layers

After the repairs to the floor, walls and support beams fill the filter compartment around the nozzles with a layer of clean quartizitic grit (2mm – 4mm) 100mm deep. After the grit fill with the remainder with a layer of clean quartizitic sand, 610 mm deep, effective size 0.9 mm (0.6 – 1.2mm) with a uniformity coefficient of 0.9. The quantity of sand required will be 45.3m³ (*22.65m³ per filter*). The sand will be supplied by Eskom.

After filling the compartment with sand, test the filter under supervision of the Engineer.

3.3.2.9 Clear well

All tiles in the clear wells must be removed and replaced with new 150mm x 150mm white ceramic tiles.

3.3.2.10 Pipes and Valves

All valves to be inspected, verified and to be replaced as necessary.

All pipes to be verified and inspected, with a wall thickness test and replaced as required. All replacement pipes to be Grade B mild steel pipes with a nominal diameter as stated in the appendices, and will be done based on thickness testing. Corrosion protection should be performed as per [11] to [15]

Flanges are to be replaced as per Flanges replaced to be steel plate flanges according to appendices.

The Contractor shall allow for replacement of all items in this scope of work, but the replacement will be dependent on inspections carried out.

3.4 Clarifiers

3.4.1 BRIDGE DRIVE

The bridge drive speed for all three clarifiers must be determined in order to ensure optimal operation of the clarifiers.

The clarifier scraper must be refurbished.

Table 4: Bridge Drive Assembly

Description	Type	Specification	Comments
Sprocket and Chain	Reduction	See below	Inspect, confirm dimensions and replace if necessary
Chain		3000 mm	Inspect, confirm dimensions and replace if necessary
Wheel Sprocket		N= 76 teeth; Size 16B; Shaft Size = 50 mm	Inspect, confirm dimensions and replace if necessary
Motor Sprocket			Inspect, confirm dimensions and replace if necessary
Wheel		D = 540 mm; Shaft D = 73.5 mm	Inspect, confirm dimensions and replace if necessary

3.4.2 CENTRE STIRRER

Centre stirrer assembly is to be examined, measured and a working assembly to be installed. The centre stirrer speed for all three clarifiers must be determined in order to ensure optimal operation of the clarifiers.

Table 5: Centre Stirrer Assembly

Description	Type	Specification	Comments
Belt drive			Inspect, confirm dimensions and replace if necessary
Gearbox	Reduction		Inspect, confirm dimensions and replace if necessary
Chain drive			Inspect, confirm dimensions and replace if necessary

Bearing			Inspect, confirm dimensions and replace if necessary

3.4.3 STEEL TRACK

Table 6: Steel Track

Description	Type	Specification	Comments
Steel track	Stainless Steel 316	200 mm width, 2 mm thickness 316 SS	Inspect, confirm dimensions and replace if necessary

3.5 Civil Scope of Work

3.5.1 SANDFILTERS

3.5.1.1 Repair Mortar Surface Priming

Aggregate must be exposed where it is not already exposed. All concrete substrate must be sound, clean and free from oils, grease or surface contaminants. All loose materials and surface laitance must be removed by high pressure water jet blasting or similar mechanical means. Small areas and 'spot' repairs should be mechanically prepared by needle gunning, bush hammering or similar means.

Thoroughly wet the prepared surfaces to a saturated condition, making sure there is no standing water. After saturation prime the surfaces with an approved surface bonding primer. Exposed steel reinforcement should be grit blasted to a bright steel condition to remove all traces of rust and contamination prior to the applying surface primer.

3.5.1.2 Repair Mortar

Use a trowel or spatula to apply the repair mortar a high build cementitious, polymer modified, repair and reprofiling mortar containing silica fume and corrosion inhibitor. wet-on-wet without any voids, to the primed surfaces. The mortar must be applied strictly in accordance with the product supplier instructions.

3.5.2 CLARIFIERS

Clarifier track (weir wall) must be cut back and repaired – It is important that the track/wall remains at the same height therefore prior to cutting back, a survey must be done to control the levels. The same should be done when installing the steel track.

Top of Weir Wall Preparation – Cut straight down 100 mm from each side of the wall to a depth of 20 mm and the existing concrete between the cuts must be removed. Cut back section must be scabbled exposing the uniform aggregate. All dust and loose material must be removed with compressed air. Surface must be sound, clean and free from oils, grease or surface contaminants.

Top of Weir Wall Priming - Thoroughly wet the prepared surfaces to a saturated condition, making sure there is no standing water. After saturation prime with an approved surface bonding primer product. Apply a coat in accordance to manufacturer specifications

Top of Weir Wall Repair Mortar – Using a trowel or spatula, a high build cementitious, polymer modified, repair and reprofiling mortar containing silica fume and corrosion inhibitor must be applied wet on wet without any voids to the bonding primer. Repairs or application procedures must be done in accordance to the manufacturers specifications. Repair mortar must be allowed to cure for a minimum of 72 Hours unless specified by the manufactures data sheet. It is important that the mortar is built up to the levels

surveyed prior to cutting back the top of wall. Care must be taken into finishing the track; it must be a smooth finish.

Post Survey of Weir Wall (clarifier track) – The track/wall must be surveyed once more to confirm the levels of the track are the same as before repairs.

Surface preparation – All surfaces of the clarifiers except the external surface must be cleaned by high pressure water jet blasting or similar mechanical means to broadcast or make the surface rough. Surfaces must be sound, clean and free from oils, grease or surface contaminants.

Crack Preparation – Cracks must be sound, clean and free from oils and grease, old coatings and surface treatments. High pressure water jetting or mechanical means such as grinding or chiselling must be used to prepare the crack. Cracks must be thoroughly cleaned to remove dust with compressed air.

Crack repairs – All cracks must be sealed and repaired with an approved sealant and repair mortar. All repairs or material applications must be done in accordance to the manufacturers specifications

Note: All materials and method statements must be approved by the Civil System Engineer on site before any work can commence.

3.6 Technical Specifications

The following specifications are provided to the *Contractor* and only materials are subject to change after the final confirmations of bill of quantities based on verifications by the *Contractor*.

Table 7: Raw Water Inlet Specification

Parameter	Units	Min	Median	Average	Max
Chlorine	mg/kg	3.7	4.6	4.94	11.2
Calcium Hardness	mg/kg	8.48	11.7	12.73	39.8
Magnesium Hardness	mg/kg	4.32	11.1	15.50	1512
Potassium	mg/kg	1.64	2.52	3.04	228
Conductivity @ 25°C	µS/cm	2.12	82.4	88.14	1518
M-alkalinity	mg/kg	3.9	17.95	20.53	272.3
Sodium	mg/kg	2.9	5.2	6.71	622
Ammonia	mg/kg	0.12	0.12	0.12	0.12
Oxygen Absorbed	mg/kg	1.5	4.9	4.72	8
pH		5.29	6.94	7.96	744
Silica	mg/kg	0.021	0.373	1.01	6
Sulphate	mg/kg	4.93	9.23	9.16	13.1
Total Organic Carbon	PPM	2.52	5.57	5.57	7.46
Turbidity	NTU	0.804	3.01	3.30	43.2

$ph\ range\ = 6.6 - 8.2$

$NTU < 10$

$TOC = 3.6\ mg/kg$

$Conductivity\ range = 100 - 150\ \mu S/cm$

$Q = 180 - 240\ l/s$

Table 8: Clarifier Performance

Parameter	Units	Min	Median	Average	Max
Chlorine	mg/kg	4.05	6.44	6.43	8.29
Fluorine	mg/kg	0	0.066	0.07	0.19
Calcium Hardness	mg/kg	7.4	11.9	12.65	19
Magnesium Hardness	mg/kg	5.67	11.4	12.13	17.4
Potassium	mg/kg	2.15	2.53	2.55	4.22
Conductivity @ 25°C	µS/cm	6.54	83.3	86.20	125
M-alkalinity	mg/kg	1.7	16.6	18.24	32.4
Sodium	mg/kg	2.47	5.18	5.36	8.54
Ammonia	mg/kg	0.07	0.07	0.07	0.07
Nitrate	mg/kg	0.01	0.05	0.41	31
pH		5.7	6.89	7.09	106.7
Silica	mg/kg	0	0.345	0.96	5
Sulphate	mg/kg	4.86	9.07	9.00	17.2
Total Organic Carbon	PPM	2.3	3.2	3.24	5.74
Turbidity	NTU	0.264	0.7015	0.79	2.92

Flowrate (per clarifier) : 120 l/s

Turbidity : < 1 NTU (target), < 2 NTU (limit)

Total Suspended Solids (TSS) : < 5 mg/L (target), < 10 mg/l (limit)

Table 9: Sandfilter Performance

Parameter	Units	Min	Median	Average	Max
Chlorine	mg/kg	5	6.47	86.58	7373
Enriched Mineral Acids	mg/kg	15	20	19.23	24
Fluorine	mg/kg	0.04	0.065	0.07	0.49
Free Chlorine	mg/kg	0	0.03	0.04	0.4
Calcium Hardness	mg/kg	5.8	12	12.89	27.8
Magnesium Hardness	mg/kg	3	11.4	18.45	1036
Potassium	mg/kg	1.97	2.53	2.58	25.5
Conductivity @ 25°C	µS/cm	0.22	84	86.99	230
M-alkalinity	mg/kg	1.8	17	23.16	2057
Sodium	mg/kg	2.47	5.22	5.47	18.1
Ammonia	mg/kg	0.09	0.095	0.13	0.22
Nitrate	mg/kg	0	0.053	0.06	0.27

Oxygen Absorbed	mg/kg	0.2	1.85	1.90	4.9
pH		0.13	6.93	6.88	9.88
Silica	mg/kg	0.024	0.365	1.00	5
Sulphate	mg/kg	4.76	9.03	8.99	15.8
Total Organic Carbon	PPM	2.5	3.145	3.22	6.36
Turbidity	NTU	0.063	0.18	0.24	1.89

Flowrate (per sandfilter) : 40 l/s

Turbidity : < 0.2 NTU

Total Organic Carbon (TOC) : Minimum of 40% drop from Raw Water Inlet across pre-treatment

Fats, Oils, Grease (FOGs) : Zero

Iron : 100 µg/kg

Manganese : 100 µg/kg

Aluminium : 100 µg/kg

Free Chlorine : 100 µg/kg

3.7 Welding specifications

All welding fabrication related activities must be performed in accordance with the latest revision of reference. The welding procedure must be in accordance to the design code of the system/component. If there is no design code (not regulated) the default welding code should be BS EN 15614.

3.7.1 BASIC REQUIREMENTS

A WPS shall be supported by a valid Welder Procedure Qualification Record/ Procedure Qualification Record (WPQR/PQR). The PQR/WPQR shall be approved by a registered International Welding Engineer registered with IIW (IWE) or International Welding Technologist registered with IIW (IWT) with minimum qualifications as defined in reference [21].

If the plant or component is not regulated under PER the default welding code to apply shall be BS EN ISO 15614.The WPQR/PQR must be as a minimum accompanied by the following documentation:

- Test coupon parent material certification – 3.1 certification required as a minimum
- Consumable material certification.
- Mechanical test certificate obtained from a South African National Accreditation System (SANAS) accredited laboratory.
- All the mechanical testing is performed as required by the relevant design code and welding code.
- Heat treatment chart (if applicable).
- All NDT results as required by the design code and relevant welding code.

3.7.2 ADDITIONAL REQUIREMENTS

- Welding documentation used for fabrication must be approved by an Eskom IWE or IWT.
- Welder Qualification Records (WQR) must be made available for review by Eskom.

- QCP's must be provided by the *Contractor* to be reviewed and accepted by Eskom before work can start.
- Acceptance levels for flaws for metallic welds must be evaluated according to Levels B, as described in BS EN ISO 5817. For projects relating to ASME BPVC designs, evaluation methods and acceptance criteria stipulated in Sections V and VIll of the code will apply
- NDT shall be performed by an entity suitably independent from the welding operation to ensure unbiased inspection.
- All technicians performing NDT shall be Eskom approved and shall be employed by an Eskom approved company.
- All NDT to be done in accordance to reference [21] and [22].

3.7.3 SANS ISO 3834-2 FABRICATION QUALITY REQUIREMENTS

The *Contractor* to be used for fabrication is required to be SANS ISO 3834-3 accredited (refer to 240-56241933 – Control of Welding during Construction, Repair and Maintenance Activities, Appendix A: Summary of SANS ISO 3834 Quality Requirements).

3.8 Corrosion protection, grouts, fillers and sealants

- All corrosion protection and sealants to be done in accordance to [11] to [15].
- The SE must complete Annexure C of the standard to be included in the SOW.
- The *Contractor* must provide the corrosion protection system and sealants proposals to be applied based on the information in Annexure C.
- This proposal is to be supplied at tender stage and must be reviewed by the Corrosion Department of Eskom, Research Testing and Development (RT&D) for acceptance.
- The Standard must be strictly adhered to. It specifies in detail the requirements from the *Contractor* which also needs to be supplied at tender stage.

3.9 Scaffolding

- Scaffolding will be supplied by the scaffolding *Contractor*. Safety harnesses and all necessary PPE must be worn at all times. A scaffolding safety certificate must be issued before scaffolding can be used.

3.10 Site De-establishment

- The *Contractor* shall clean and clear the site to the original conditions.
- The *Contractor* shall remove and dispose waste generated to the designated disposal site.

3.11 Commissioning and Test

The *Contractor* is responsible for the initial commissioning plan of the newly refurbished sand filters and clarifiers. Commissioning and tests shall be conducted in the presence of the Project Supervisor, Project Manager, System Engineer, Maintenance Personnel and Operating Personnel. All tests only to commence once safety clearance has been done and the plant is found safe to operate.

3.12 System characteristics

3.12.1 RELIABILITY AND AVAILABILITY

Reliability and availability of the refurbished sand filters and clarifiers should be 95%.

3.12.2 LIFE EXPECTANCY

The refurbished sand filters should last for 30 years.

3.12.3 SUPPORTABILITY

The *Contractor* shall be able to fully support the system from resources within the Republic of South Africa regarding:

- Technical service and support.
- Spares availability for at least 10 years.

3.12.4 MAINTAINABILITY

The system should preferably be supplied and supported locally.

3.13 QUALITY MANAGEMENT

3.13.1 CONTRACT QUALITY MANAGEMENT PLAN REQUIREMENT

The *Contractor* shall comply with the Employer's Quality Requirements as specified in Eskom QM58 document and ISO 9001:2008.

A sound quality control plan with witness and hold points is to be compiled and followed.

3.13.1.1 Configuration management

Any documents received during the refurbishment process such as datasheets, operating manuals, maintenance manuals for equipment supplied must be stored in accordance with 240-86973501 - Engineering Drawing Standard – Common Requirements.

3.13.2 SITE ACCEPTANCE TEST

The Employer will operate the refurbished sand filters in the presence of the *Contractor* to prove that it meets the Employers requirement.

The test shall pass if there is sufficient turbidity and TOC removal across the pre-treatment plant with outlet turbidity and TOC as per reference [8]. There must also be no hindrance of flow and the flow must be in accordance to design flows. The automatic control, if applicable, must work in accordance to the operating and control philosophy.

During the backwash test, it must be confirmed that the air and water flow through the sand filter bed is evenly distributed. The plant must also operate as per the design after a backwash with regards to the differential pressure as well as the turbidity and TOC quality. This site acceptance test must be done over at least 3 filtration cycles.

Where the results of the performance tests performed don't correlate with expected results (concentration values, flow rates, pressures etc.) and/or the control functions as per the operating philosophy do not meet

the specifications guaranteed, the *Contractor*, at his own expense, carries out all necessary adjustments and modifications to the works required to obtain the stated tolerances.

Full detailed proposals are submitted in writing to the *Project Manager* for approval before any adjustments and modifications are made and work in this respect is carried out when convenient to the *Project Manager* and does not interfere with the operational requirements of the WTP. All adjustments and modifications are subject to inspection and approval by the *Project Manager*.

When adjustments and modifications are completed, the *Contractor* advises the *Project Manager* in writing to this effect and applies for a further acceptance test. From the results obtained, and provided that the Employer is satisfied that it will be lasting, the works will be finally accepted by the *Employer*.

3.13.3 PERFORMANCE GUARANTEES

The *Contractor* guarantees and demonstrates, through mutually specified acceptance tests the operational performance of the works.

The performance criteria evaluated shall be in accordance with the site acceptance criteria as a minimum.

3.13.4 TEST CERTIFICATES

The *Contractor* provides a test certificate for each test as mentioned above to the Project Manager for acceptance. The *Contractor* indicates the details of tests he proposes to perform and the manner in which the results of tests will be documented, the following certificates and documents need to be submitted:

- Welding certificates done at the workshop (Eskom welding standard to be shared with the *Contractor*).
- Proof of qualifications of certified welders
- Material data sheets to be submitted (chemical and physical composition of the material).
- Batch certificates to be submitted

3.14 Warranty

The installing *Contractor* shall provide a one-year complete coverage warranty that includes all parts, materials, labour, travel costs, per diem, and all miscellaneous costs.

3.15 Services Provided By The *Employer*

3.15.1 ELECTRICAL SUPPLY

The *Employer* will make available to the *Contractor* temporary 220/230/380-volt electrical supplies free of charge from the closest existing point of supply.

The *Contractor* is to make provisions for the necessary extensions and plug points. Any changes made to existing supplies will be on the *Contractor's* account.

3.15.2 SCAFFOLDING AND PLATFORMS

The *Employer* will provide all scaffolding and the need for these items should be pre-arranged with the *Employer's Representative* giving sufficient time to allow for him/her to make arrangements.

3.16 Standards, Specifications and Procedures

All material and equipment shall be new and of the standard and quality specified.

Tenderers shall ensure that they are fully acquainted with the contents of the applicable specifications.

The design and manufacture of equipment and the complete installation shall be carried out and tested in accordance with the latest issue or amendments of the Standards and Regulations in 2.2.

4. AUTHORISATION

This document has been seen and accepted by:

Name	Designation
Jerushan Pillay	WTP System Engineer
Jason Bennett	Civil Engineer
Justin Varden	Senior Engineer
Neo Muthavhine	Auxiliary Engineering Manager
Ntombi Mtsweni	WTP
Nqobile Kolobe	WTP
Ethel Simelane	WTP
Heggie Mashaba	MMD
Mapula Sethosa	MMD
Sibusiso Ngwenya	MMD Manager
Sumayyah Sulliman	Asset Management

5. REVISIONS

Date	Rev.	Compiler	Remarks
2022-8	0	J Pillay	Draft Document
2022-09	1	J Pillay	Final Document for Signature

6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

- Jerushan Pillay

APPENDIX A - SCHEDULES

Table 10: Pipe Schedule

Section	Description	Material	Length	Specification	Action
1	Raw water tap-off to Water Treatment Plant	Mild Steel	150m	DN700, PN16	Wall Thickness Test; Visual Inspection; Replace if required
2	Raw Water Tap Off (From Section 1 to Flash Mixer, 00UA01G010)	Mild Steel	60m	DN400, PN16	Wall Thickness Test; Visual Inspection; Replace if required
3	Strainer bypass	Mild Steel	10m	DN400, PN16	Wall Thickness Test; Visual Inspection; Replace if required
4	Clarifier Inlet	Mild Steel	60m	DN450, PN16	Wall Thickness Test; Visual Inspection; Replace if required
5	Sand filter outlet	Mild steel, rubber-lined	180m	DN200, PN16	Wall Thickness Test; Visual Inspection; Replace if required
6	Post Backwash	Mild Steel	180m	DN200, PN16	Wall Thickness Test; Visual Inspection; Replace if required
7	Backwash	Mild Steel	240m	DN300, PN16	Wall Thickness Test; Visual Inspection; Replace if required

NB: All pipe lengths are approximate

All pipes to be corrosion protected as per [11] to [15].

Pipes and flanges to be designed according to [18].

Table 11: Valve Schedule

Description	Quantity	Type/Material	AKZ Code	Specification	Action
Coagulant Isolation Valve	2	Stainless Steel Ball Valve	-	DN25, PN16	Inspect and replace/supply
Inlet Strainer Isolation Valve	1	Mild Steel	00UA01 S501	DN400, PN16	Inspect and replace
Outlet Strainer Isolation Valve	1	Mild Steel	00UA01 S502	DN400, PN16	Inspect and replace
Strainer Bypass Isolation Valve	1	Mild Steel	00UA01 S504	DN400, PN16	Inspect and replace
Streaming Current Isolation Valve	1	Stainless Steel Ball Valve	-	DN25, PN16	Inspect and replace/supply
Flash Mixer Pneumatic Control Valve	1	Mild Steel	00UA01 S201	DN400, PN16	Inspect and replace
Flocculant Isolation Valve	2	Stainless Steel Ball Valve	-	DN25, PN16	Inspect and replace/supply
Flash Mixer Inlet Isolation Valve	1	Mild Steel	00UA01 S505	DN400, PN 16	Inspect and replace
Flash Mixer Overflow Isolation Valve	1	Mild Steel	00UA01 S503	DN200, PN 16	Inspect and replace
Clarifier A/B/C Inlet Isolating valve	3	Gate	00UA11/A12/A13 S501	DN400, PN16	Inspect and replace
Clarifier A/B/C blowdown	3	Gate	00UH11/UH12/UH13 S501	DN150, PN16	Inspect and replace
Clarifier A/B/C Small Blowdown Valves	9	Ball valve	00UH11/12/13 S502/S503/S504	DN25, PN16	Inspect and replace/supply
Launder drain valve's A,B,C	3	Gate/Mild Steel	00UA11/12/13 S401	DN150, PN 16	Inspect and replace
Launder isolation valve's East and West	2	Spade/Mild Steel	00UA20 S501/S502	DN150, PN 16	Inspect and replace

Sandfilter inlet isolation valve 1-12	12	Tilt/Mild Steel	00UA21/22/23/24/25/26/27 /28/29/30/31/32 S501	DN250, PN16	Inspect and replace with gate valve
Sandfilter float valve 1-12	12		00UA21/22/23/24/25/26/27 /28/29/30/31/32 S001	DN200, PN16	Inspect and replace with new float valve
Sandfilter outlet isolation valve 1-12	12	Gate/Mild Steel	00UA21/22/23/24/25/26/27 /28/29/30/31/32S501	DN200, PN 16	Inspect and replace with valve that can be actuated
Sandfilter backwash valve 1-12	12	Gate/Mild Steel	00UA83S501/S502/S503/ S504/S505/S506/S507/S508/ S509/S510/S511/S512	DN300, PN 16	Inspect and replace with valve that can be actuated
Sandfilter post backwash valve 1-12	12	Gate/Mild Steel	00UA21/22/23/24/25 /26/27/28/29/30/31 /32S503	DN200, PN 16	Inspect and replace with valve that can be actuated

NB: All pipes to be corrosion protected as per [11] to [15].

Valves to be designed according to [17].