City of Johannesburg

Johannesburg Water SOC Ltd

Turbine Hall
65 Ntemi Piliso Street
Newtown
Johannesburg

Johannesburg Water
PO Box 61542
Marshalltown
2107

Tel +27(0) 11 688 1400
Fax +27(0) 11 688 1528

www.johannesburgwater.co.za

ADDENDUM	**NO. 01**
CONTRACT NUMBER:	**JW14060RR**
CONTRACT TITLE:	**JW14060 RR NORTHERN WASTEWATER TREATMENT WORKS: DEWATERING BUILDING BELT PRESS REPLACEMENT AND ASSOCIATED ANCILLARIES.**
SUBJECT	**ADDENDUM 1**
DATE	**08 JANUARY 2025**
SENDER	**THAPELO TEANE, 011 688 6615** thapelo.teane@jwater.co.za **GCINA NDELA,011 688 1796** gcina.ndela@jwater.co.za

Tenderers are required to incorporate the following documents into the tender document and return the Addendum:

- **Replace: Contactable Reference Form, Page RD 28 and RD 29.**
- **Volume 1 Tender and Contract Section C1 Agreement and Contract Data**
- **Clause 1.2.1.1 Contract Specific Data**

- **GCC Clause 5.16.1 on Page C.7**

  Replace the words **"….as described in the Scope of Works (Section PS5.4), and Clause 1.1.1.14."** with **""….as described in the Scope of Works (Section PS1.2), and Clauses PS 1.2.1 and PS 1.2.2."**

- **GCC Clause 5.16.3 on Page C.8**

  Replace the words **"The latent defects period is Ten (5) years for Civil Engineering Building works…."** with **"The latent defects period is Ten (10) years for Civil Engineering Building works…."**

- **C1.2.1.2.14 Special Conditions om Page c.17**

  Replace the words **"..30%.."** in clause 2. at the bottom of Page c.17 with **"..15%..".**

Volume 2A Part 3 – Scope of Works

- **Clause PSX2.2.4 Specific design, performance and operational parameters on Page P.175**

  In the 5th paragraph, replace the words **"….. not less than 10 no. dewatering pressure rolllers ….."** with **"….. not less than 14 no. dewatering pressure rolllers ….."**

City of Johannesburg

Johannesburg Water SOC Ltd

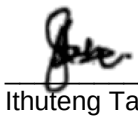
Turbine Hall
65 Ntemi Piliso Street
Newtown
Johannesburg

Johannesburg Water
PO Box 61542
Marshalltown
2107

Tel +27(0) 11 688 1400
Fax +27(0) 11 688 1528

www.johannesburgwater.co.za

Yours faithfully



Ithuteng Tabe
Acting General Manager: Supply Chain Management

Addendum Received

Name of Tenderer:……

Signatory:……

Signature:……

Date:……

T2.1.6 Schedule of the Tenderer's Experience

EMPLOYER: CONTACT PERSON AND TELEPHONE NUMBER	EMPLOYER'S AGENT OR REPRESENTATIVE: CONTACT PERSON AND TELEPHONE NUMBER	NATURE OF WORK	VALUE OF WORK (inclusive of VAT)	DATE COMPLETED OR EXPECTED TO BE COMPLETED

Signed ..... Date .....

Name Position

Tenderer	

T 2.1.7 CONTACTABLE REFERENCE

To Johannesburg Water (SOC) Ltd

I, the undersigned being duly authorised to do so, hereby furnish a reference to Johannesburg Water relative to tender Contract No**. JW14060RR** for the **Dewatering Building Belt Press Replacement and Associated Ancillaries**

Name of Tenderer: ……

Description of Services provided:
……..
……
…..……
……..

Discipline ……..

Project Value ……

Name of authorized person: ……..

Signature : …….. Date ……

Telephone/Mobile:

……..

Email: ……

Completed on behalf (Name of Client)

……

NB: This document must be completed by the referee and included in the tender submission. Alternatively, the client's letterhead may be used for this purpose provided it complies with the functional criteria requirements. A separate form must be completed for each reference as required in the evaluation criteria. Information provided will be verified and if found to be false or misrepresented, punitive measures will be instituted against the respective party including blacklisting and restriction from participating in any future government tender.

T 2.1.7 CONTACTABLE REFERENCE

To Johannesburg Water (SOC) Ltd

I, the undersigned being duly authorised to do so, hereby furnish a reference to Johannesburg Water relative to tender Contract No**. JW14060RR** for the **Dewatering Building Belt Press Replacement and Associated Ancillaries**

Name of Tenderer: ……

Description of Services provided:
……..
……
…..……
……..

Discipline ……

Project Value……

Name of authorized person: ……..

Signature: ……..Date ……

Telephone/Mobile:

……..

Email: ……

Completed on behalf (Name of Client)

……

NB: This document must be completed by the referee and included in the tender submission. Alternatively, the client's letterhead may be used for this purpose provided it complies with the functional criteria requirements. A separate form must be completed for each reference as required in the evaluation criteria. Information provided will be verified and if found to be false or misrepresented, punitive measures will be instituted against the respective party including blacklisting and restriction from participating in any future government tender.

T 2.1.8 SCHEDULE OF KEY PERSONNEL

In terms of the Project Specification and the Conditions of Tender, unskilled workers may only be brought in from outside the local community if such personnel are not available locally.

The Tenderer shall list below the personnel which they intend to utilize on the Works, including key personnel which may have to be brought in from outside if not available locally.

CATEGORY OF EMPLOYEE	NUMBER OF PERSONS					
	KEY PERSONNEL, PART OF THE TENDERER'S ORGANISATION		KEY PERSONNEL TO BE IMPORTED IF NOT AVAILABLE LOCALLY		UNSKILLED PERSONNEL TO BE RECRUITED FROM LOCAL COMMUNITY	
	HDI	NON-HDI	HDI	NON-HDI	HDI	NON-HDI
Site Agent, Contracts Manager						
Foremen, Quality Control and Safety Personnel						
Technicians, Surveyors, etc.						
Artisans and other Skilled workers						
Plant Operators						
Unskilled Workers						
Others: ……..... ..... ……						

SIGNATURE:.....…… DATE: …….....

(of person authorized to sign on behalf of the Tenderer)

T2.1.9 CURRICULUM VITAE OF KEY PERSONNEL

Provide separate forms for each position listed in Key Personnel Forms:

Proposed role in the Project	

1. Surname	
2. First Name	
3. Date and place of birth	
4. Nationality	
5. Membership of Professional Bodies and Professional Registration	

6. Education

Institution (Date from – Date to)	Degree(s) or Diploma(s) obtained

7. Post Graduate / Diploma Experience

Company / Organisation	(Date from – Date to)	Years of Employment	Position

8. Key Experience Relevant to Project

Project Name and Locality	
Project Dates and Value	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and Duties	

Project Name and Locality	
Project Dates and Value	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and duties	

Project Name and Locality	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and duties	

Project Name and Locality	
Project Dates and Value	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and duties	

Project Name and Locality	
Project Dates and Value	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and duties	

I,……., hereby declare that I am aware of the inclusion of my Curriculum Vita in the proposed project team and make myself available for this project.

Signature : ……

Date : ……

Provide separate forms for each position listed in Key Personnel Forms:

Proposed role in the project	

1. Surname	
2. First Name	
3. Date and place of birth	
4. Nationality	
5. Membership of Professional Bodies and Professional Registration	

6. Education

Institution (Date from – Date to)	Degree(s) or Diploma(s) obtained

7. Post Graduate / Diploma Experience

Company / Organisation	(Date from – Date to)	Years of Employment	Position

8. Key Experience Relevant to Project

Project Name and Locality	
Project Dates and Value	

Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and Duties	

Project Name and Locality	
Project Dates and Value	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and duties	

Project Name and Locality	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and duties	

Project Name and Locality	
Project Dates and Value	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and duties	

Project Name and Locality	
Project Dates and Value	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and duties	

I,……., hereby declare that I am aware of the inclusion of my Curriculum Vita in the proposed project team and make myself available for this project.

Signature : ……

Date : ……

Provide separate forms for each position listed in Key Personnel Forms:

Proposed role in the project	

1. Surname	
2. First Name	
3. Date and place of birth	
4. Nationality	
5. Membership of Professional Bodies and Professional Registration	

6. Education

Institution (Date from – Date to)	Degree(s) or Diploma(s) obtained

7. Post Graduate / Diploma Experience

Company / Organisation	(Date from – Date to)	Years of Employment	Position

8. Key Experience Relevant to Project

Project Name and Locality	
Project Dates and Value	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and Duties	

Project Name and Locality	
Project Dates and Value	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and duties	

Project Name and Locality	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and duties	

Project Name and Locality	
Project Dates and Value	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and duties	

Project Name and Locality	
Project Dates and Value	
Project Position (e.g. Project Manager, Engineer, etc.)	
Description of Scope and duties	

I,……., hereby declare that I am aware of the inclusion of my Curriculum Vita in the proposed project team and make myself available for this project.

Signature : ……

Date : ……

JOHANNESBURG WATER (SOC) Ltd.

BULK WASTEWATER

PARTICULAR SPECIFICATION

M15: FILTER BELT PRESS EQUIPMENT

Johannesburg Water (SOC) Ltd.
PO Box 61542
Marshalltown
2107

Revision 5 June 2024

DOCUMENT CONTROL SHEET

Document Title: **Particular Specification – M15: FILTER BELT PRESS EQUIPMENT**

JW Reference: **Bulk Wastewater Asset Management**

Document Ref. No: **M15**

DOCUMENT APPROVAL

ACTION	FUNCTION	DATE APPROVED	BRIEF DESCRIPTION
Reviewed and Approved by	Bulk Wastewater Task Team	2024-06-24	**Updating and addressing Standard Committee comments**
Adopted by	Standards Committed	2024-02-01	**Refer to Meeting Minutes of 2024-02-01. Approved subject to comments update**

RECORD OF REVISIONS

Date	Revision	Version	Author	Comments
2024-06-24	5	3	Bulk Task Team	Updating and addressing Standard Committee comments
2024-02-01	5	2	Bulk Task Team	Presented at the Standards Committee
2021-10-22	5	1	J Prinsloo	External Consultant Panel JW13001 Detailed Review
2013-10-23	4		J Ritchie	Minor updates and re-issued
2012-07-30	3		T Wellard	General review
2010-02-16	2		J Ritchie	General review
2009-05-12	1			Review of Mechanical / Electrical and Control / Instrumentation Standards, plus New Design Guidance

NB. This version and document is prepared for Johannesburg Water (SOC) Ltd to be used as Particular Specifications, Standards and Guidelines for Bulk Wastewater Treatment Assets and was adopted and approved by the Standards Committee on 01 February 2024, with minor comments updated and finalised by the Bulk Wastewater Task Team on 10 June 2024.

Approval Confirmed by Standard Committee Bulk Wastewater Task Team Chairperson or delegate

Date

PARTICULAR SPECIFICATION: VOLUME M15: FILTER BELT PRESS EQUIPMENT

CONTENTS

M15.1 SCOPE

This specification covers the detailed design parameters, manufacture, supply, off-loading on site, installation, testing and commissioning of mechanical belt filter press and ancillary equipment for the dewatering of anaerobic digested sludge and waste activated sludge generated at wastewater treatment works. The Specification shall be read in conjunction with that Project Specification and other relevant Particular Specifications.

M15.2 INTERPRETATIONS

This specification shall be interpreted as follows:

- For the Employer design components, it shall be regarded as a specification.
- For the Contractor design components obligations, it shall be regarded as an Employer's requirements.
- The design of the complete belt press installation, including all ancillaries such as but not limited to wash water, poly dosing, sludge feed and lifting equipment, shall be subject to the Employer's Agent or Employer's Representative.

M15.2.1 Definitions

For the purpose of this Specification the following definitions apply:

a) "**Manufacture**" includes, as applicable, the purchase of materials or goods, fabrication and assembly, any specified corrosion protection measures and any off-site inspection or testing of materials or parts.

b) "**Supply**" includes, as applicable, the purchase of materials or goods, manufacture and fabrication, any specified corrosion protection measures and all required off-site inspection or testing.

c) "**Installation**" includes, as applicable, all handling and transport from storage, erection and aligning of Works.

d) "**Factory Acceptance Test (FAT)**" shall refer to all tests done on Plant or Plant items at the factory to ensure its functionality.

M15.2.2 Abbreviations and Material Symbols

In this Specification the following abbreviations will apply: -

°C	: Temperature in degrees Celsius
A	: Current
AC	: Alternating Current
AGMA	: American Gear Manufactures Association
ANSI	: American National Standards Institute
API	: American Petroleum Institute
ASCE	: American Society of Civil Engineers
ASME	: American Society of Mechanical Engineers
ASTM	: American Society for Testing and Materials
BFP	: Belt Filter Press
BS	: British Standards Institution
BSPT	: British Standard pipe thread
CAD	: Computer Aided Drawing
CAM	: Computer Aided Manufacturing
CIP	: Cleaning in Place
COC	: Certificate of Conformance
D	: Diameter
DB	: Air Dry Bulb temperature
dB(A)	: Sound pressure level, "A" weighed in decibels

DCS	: Distributed Control System
DFT	: Dry Film Thickness
DIN	: Deutsch Industry Normen
DN	: Nominal diameter
DO	: Dissolved Oxygen
DP	: Differential Pressure
Eff.	: Filter efficiency in %
EPDM	: Ethylene Propylène Diène Monomer
ERW	: Electrical resistance weld
ETP	: Effluent Treatment Plant
FA	: Flange adaptor
FAT	: Factory Acceptance Tests
FBE	: Flanged both ends
FOE	: Flanged one end
FW	: Field weld
HDPE	: High Density Polyethylene
ID	: Inside diameter
ISO	: International Organisation for Standardization
JW	: Johannesburg Water
ℓ/s	: Flow in litres per second
LV	: Low Voltage
m	: Distance in metre
m.a.s.l	: Metres above (mean) sea level
m/s	: Air speed in metres per second
MCC	: Motor Control Centre
mm	: Dimension in millimetres
MPVC	: Modified Polyvinyl Chloride Pipes
MV	: Medium Voltage
N+1	: N units in operation + 1 installed spare
Nm3/hr	: Normal cubic meters per hour
O&M	: Operation and Maintenance
OD	: Outside diameter
OHS	: Occupational Health and Safety
Pa	: Pressure in Pascals
PBE	: Plain both ends
PE	: Plain end
PN	: Nominal pressure (Rating)
PPE	: Personal Protective Equipment
PQP	: Project Quality Plan
PSV	: Pressure Safety Valve
QCP	: Quality Control Panel
RFA	: Restrained flange adaptor
rpm	: Rotational speed in revolutions per minute
SAECC	: South African Electrolytic Corrosion Committee
SANS	: South African National Standards
SAT	: Site Acceptance Tests
SAW	: Submerged arc weld
SCADA	: Supervisory Control and Data Acquisition
SIS	: Swedish Institute of Standards
SOC	: Slip-on coupling
SS	: Soft Starters
S/S	: Stainless Steel
SST	: Secondary Settling Tank
STP	: Standard Temperature and Pressure (T=20°C, P=101,3kPa)
t	: Wall thickness of pipes
TDS	: Total Dissolved Solids
uPVC	: Unplasticised Polyvinyl Chloride
VSD	: Variable Speed Drive
WB	: Air Wet Bulb temperature
WB	: Air Wet Bulb temperature

WP (B) : Weld preparation (Butt)

M15.2.3 Standards

All design standards for the belt press equipment shall be subject to the latest amendments and editions of the following standard specifications: -

SANS 10400: 1990	:	National Building Regulations
PD 5304:2014	:	Guidance on safe use of machinery
SANS-1	:	Testing of welders, where applicable to the type of welding required SANS 15614-1: Specification and qualification of welding procedures for metallic materials - Welding procedure test Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys
BS ISO1312-1:2018	:	Rolling bearings. Accessories for sleeve type linear ball bearings. Boundary dimensions, geometrical product specifications (GPS) and tolerances for series 1 and 3
ISO 9000	:	Quality management
SANS 10111-2-1	:	Engineering Drawing Part 1: General Principles Engineering Drawing Part 2: Geometric Tolerancing Section 1
SANS 1700-5-9	:	Fasteners Part 5: General requirements & material properties Section 8: Corrosion resistant stainless steel fasteners-Bolts, Screws & Studs
SANS 1700-5-10	:	Fasteners Part 5: General requirements & material properties Section 8: Corrosion resistant stainless steel fasteners-Nuts
SANS 10341	:	Installation and maintenance of bearings – General guidelines
SANS 10162-1	:	The structural use of steel Part1: Limit-states design of hot-rolled steelwork
SANS 10162-2	:	The structural use of steel Part1: Limit-states design of cold-formed steelwork
SANS 10162-4	:	Structural use of Steel Part 4: The design of cold-formed stainless steel structural
SANS 10104	:	Hand railing and balustrading (safety aspects)

M15.2.4 Other relevant Particular Specification

This specification must be read in conjunction with the following specifications: -

M08: Particular Specification for Gearboxes

M16: Particular Specification for Conveyor Equipment

M19: Particular Specification for Dosing Pumps

M21: Particular Specification for Pressure Pipework

M30: Particular Specification for Polyelectrolyte handling, storage, make up and dosing

E01: Particular Specification for Electric Motors

G01: Particular Specification for Colour Codes

G02: Particular Specification for Corrosion Protection

Volume 1: Automation and Control Design Standards SCADA

Volume 3: Automation and Control Design Standards PLC Panels

Volume 6: Automation and Control Design Standards Cabling

Volume 8: Automation and Control Design Standards Flow Measurement

Volume 9: Automation and Control Design Standards Level Measurement

Volume 21: Automation and Control Design Standards Pressure Measurement

M15.3 GENERAL DESIGN PARAMETERS

Equipment shall be designed:

- To ensure reasonable standards of engineering in design, materials selection and construction processes;
- To facilitate manufacture, inspection, installation, maintenance, cleaning and repairs;
- To ensure safe and satisfactory operation for an acceptable life expectation of 15 years under the ambient conditions prevailing at the Site;
- The offered equipment shall be support in forms of spares by the original equipment manufacturer for at least 15 years in alignment with the specified life expectancy from project installation; To prevent undue stresses being produced by expansion due to temperature changes;
- To keep maintenance costs to a minimum that represent the value for money in both the initial purchase and subsequent running costs;.
- To facilitate inter-changeability of units and/or sub-parts throughout the Contract works with regard to new equipment and equipment and/or sub-parts currently being used on the existing JW Wastewater Treatment Works;
- To operate without undue vibration and excessive noise. Maximum of 75dBA measured at 1 metre from operating equipment;
- To comply with the legal requirements in respect of safety such as the Occupational Health & Safety Act, 1993 and Regulations as well as the prevention of water and air pollution;
- To satisfy any specific requirement contained in the statutory codes and legislation;
- To be suitable for operation 365 days per year, 24 hours per day under specified design conditions; and
- The minimum availability of the equipment shall be 99 %.

M15.4 CONVEYOR SYSTEMS

The design of the conveyor system shall comply with particular specification M16: Conveyor Equipment. Specific design parameters pertaining to the project shall be detailed in the Project Specification.

M15.5 POLYELECTROLYTE MAKE-UP AND DOSING SYSTEM

The polyelectrolyte make-up and dosing installation shall compile with particular specification M30: Polyelectrolyte Handling, storage, make up and dosing. The dosing rate shall be as specified in the Project Specification.

M15.6 SPECIFIC PERFORMANCE DESIGN PARAMETERS

The sludge feed stream will have a solid content between 2 per cent and 6 per cent by mass. Sludge will be fed to the press at a rate of between 600 and 900 kg dry

solids per hour.

A minimum Dry solids content of 18 per cent for the blended waste activated sludge and digested sludge is required to be achieved by the presses. Flocculent dosing must not exceed 4.5 kg per ton of dry solids. The belt filter press unit shall have an effective belt width of between 2 and 2.3 m.

The Contractor shall offer a belt press with guaranteed performance parameters and all state performance parameters shall be based on sludge sample taken from the specific Works concerned. The Contractor shall be granted access to the Works concerned during the Tender stage for the purpose of sludge sample testing. Works access required shall be through the Employer's Agent/ Employer's Representative as stated in the tender document. – It is recommended that the sample testing should be done before the tender closing period. Should this test not be done, during the period, it will be regarded that the Tender will offer guarantee of performance as per the specified performance values provided under this specification and the project specification. Sufficient information will be provided in the tender document relating to the sludge characteristics, but these will most historic data which is based on various operational assumptions.

Filtrate and washwater effluent quality shall be that the suspended solids content does not exceed 1000 mg/l and 150 mg/l respectively unless otherwise stated in the project specification.

The belt press design shall incorporate a large gravity dewatering section to pre-thicken the sludge prior to entering the press stages of the dewatering section. Sludge ploughs shall be strategically positioned on this section to assist with the removal of excess liquid. Drainage of filtrate from the flocculated sludge shall ensure that no blinding of the belts occurs due to sludge movement. The Sludge ploughs shall ensure a uniform distribution of sludge across the working width of the belt. Sludge ploughs shall be adjustable safely without the need to stop the machine.

The pressure dewatering section shall comprise a set of not less than 10 no. dewatering pressure rollers of adequate size to achieve the required degree of dewatering with the pressure being evenly distributed on the sludge to prevent it from being squeezed through or out of the sides of the filter cloth. Rollers shall be of rigid design to prevent uneven pressure and cake distribution due to deflection of the rollers. The minimum diameter of the pressure rollers shall be 215mm and with a thickness of 7mm. The belt press roller design and positioning shall be such that rewetting of the sludge is prevented through effective continuous release of filtrate from the belt press.

The pressure rollers shall be designed using a minimum design load of 15 N per linear millimetre with a maximum deflection of less than 1.5mm for the entire length of the roller between the end bearing supports.

M15.6.1 Filter Belt Press Construction

The press shall be a robust unit incorporating a Stainless Steel frame, stainless steel filtrate collection trays and sump, as well as a sludge inlet distribution and flocculation system with a stainless-steel sludge distribution chute. The pressure rollers shall be manufactured using either stainless steel and/or corrosion protected carbon steel shell to ensure optimum life. The roller construction material and in specific the bearing stub shafts shall be selected with due consideration to the belt presses operation and the operating environment conditions to ensure that the roller life cycle is the same as the overall life expectation of the belt presses unit of 12 years. The roller design shall be supported by factual operational records and design calculation with assumed safety factors.

In adjudication of the contract, consideration will be given to the overall mass of the belt press unit. In order to comply with the technical requirements of this specification it is envisaged that a belt press with a total minimum mass of 7000kg will be required.. Contractor to provide the complete mass of the belt press assembly in kg and the mass of the heaviest component in the offered belt press.

Materials of construction and all parts, excluding the rollers, in contact with the sludge, washwater 'and liberated- gases, shall be manufactured from grade 316L stainless steel. In order to contain and manage splashing and to minimize aerosol escape from the press, the design shall be of the enclose type, with all components such as bearings, limit switches and drives units outside of the enclosed area.

All bearings shall be suitable for the operational environment such as corrosive and high pressure washing. All bearings shall be greased and selected for a minimum bearing life of 200 000 hours (L10) and should be housed external to the filter belt press side frames away from the wet sections. The enclosure of the bearings shall be design with proper protection to ensure prevent moisture and other contamination which are likely to damage the bearing. Bearing lubrication points shall be accessible from the external of the belt press enclosure regardless of the location of the bearing, and all bearings shall be lubricated and effectively sealed against penetration by dust and water. The belt press shall be supplied with an automatic lubrication system.

All bearing shall be off the shelf items, available from local distributors and suppliers, a complete detail list of bearings in use in the belt press design shall be provided with the tender documentation for the purpose of local availability assessment of the proposed bearing.

M15.6.2 Belt Wash Water System

The belt press wash water system shall be designed to ensure effective washing of the filter belt to prevent blinding to maintain continuous permeability. The spray nozzles shall be specifically designed for filter belt washing purpose and the spray pattern design shall be of overlapping to avoid blind spots. The wash water system shall be designed for a pressure of between 6 to 9Bar with a maximum water consumption of 15m^3/hr and the nozzle header shall be accessible for inspection and maintenance purposes. The wash water pipework with associated supported shall be manufactured from grade 316 L stainless steel. PVC piping shall not be acceptable.

The filtrate drain for each belt press shall be open for visible inspection.

The wash water supplied by the Client will be the final effluent from the chlorinated outfalls from the secondary section of the Works, which can contain up to 150 mg/l solids. The design requirement of the wash water quality solids in (mg/L), volume in (m^3/h) and cleaning pressure in (kPa) for each type of belt press shall be stated by the Tenderer. Should the offered belt press supplied, require additional filtration system and supply requirements different from the one specified or in the project specification. The Contractor shall offer with their tender, a detail designed system subject to the approval of the Employer’s Agent or Representative.

The spray system shall be self-cleaning, and the brush system shall be removable for inspection purposes.

M15.6.3 Enclosure and Guards

The press unit offered shall be totally enclosed on all sides (including the gravity filtration section), and suitable for operation under a negative pressure.

The air extraction opening(s) shall be positioned such that the amount of spray water drawn directly into the ducting is minimized.

Inspection hatches shall be provided on both sides of the press and at the top of the enclosure to allow examination inside the enclosure of the belts, rollers and general operation of the press.

The maximum total area of all permanently open apertures in the enclosure shall be stated in the data sheet for the belt press. Total open areas of 0.2 m² shall be considered as acceptable.

All moving mechanical and electrical components requiring on-line adjustments and servicing, shall be easily accessible for process operation, inspection and maintenance purposes. The enclosure and guards shall be designed in compliance with the requirement of the Occupational Health and Safety ACT, 1993.

M15.6.4 Sludge Flocculation

Sludge flocculation mixing design shall ensure effective mixing of the sludge and polyelectrolyte and ensure that there is sufficient time to achieve the designed flocculation prior to feeding of the sludge onto the filter belt. Preference shall be given to mixing designs with proven reliability in the sludge environment and the least maintenance requirements.

If a flocculation tank and an agitator mixing option is offered, then the inlet end of the sludge line shall be fitted with an upward flow flocculation tank. A suitable designed mixer with continuously variable speed adjustment shall be provided in the flocculation tank for gentle mixing of the sludge and flocculent ensuring that any heavy sludge particles are kept in suspension. The mixer impellor shall be manufacture from 316 L stainless steel.

The flocculation tank shall discharge via a stainless-steel spreader chute that shall ensure an even flow of sludge onto the gravity dewatering zone of the belt press. The spreader chute should be at an angle for easy flowing to prevent build up of sludge cakes.

If an in-line mixer is offered, an inspection box shall be provided prior to discharging onto the filter belt section of the belt press as a visual check on the flocculation process.

In all case adequate contact time between the feed sludge, the inspection box and the flocculation tank shall be provided.

M15.6.5 Sludge Cake Handling

The press shall be provided with a stainless-steel cake discharge chute suitable for delivering the sludge cake on to the sludge cake conveyor belt as indicated on the general arrangement drawing.

A scraper mechanism shall be provided for continuous removal of sludge cake from the filter belt. Scrapers shall be positioned in such way that it does not damage the filter belt or cause excessive wear or damage to the filter belt. The scraper blade shall allow for adjustment to accommodate operational wear and the blade shall be constructed from abrasion resistant material. Adequately sized collection trays and sumps within the press housing shall be provided to collect wash water and liquids from the sludge and to prevent re-wetting of the sludge cake. All liquids shall be piped to a common outlet at the base of the press and suitably flanged for external drainage piping.

M15.6.6 Filter Belt

The filter belts shall be provided as part of the belt press assembly and shall be

manufactured from high permeable durable woven monofilament polyester fibre selected to satisfy the duty requirements specific to the operational condition with an expected life of 4000 hours. The seam shall be a rugged stainless steel. clipper seam with adequate strength to satisfy the operational requirements of the belt press such as belt tension and roller pressure, the clipper seem shall be subject to approval of the Employer's Agent/ Employer's Representative.

M15.6.7 Drive Unit

The belts shall be driven through a geared motor-speed-reducer drive unit, the drive unit arrangement shall provide positive drive for each filter belt. It shall be possible to inspect all transmission components by removing the cover plate(s). It shall be further possible to perform inspection and /or replacement of transmission components without disturbing/removing the rollers and to carry out oil drainage or oil re-fill during maintenance. Single drive unit is preferred in the interest of enhancing reliability with the use of the least components, and where dual drives are offered, the drives shall use an approved synchronizing system, subject to the approval of the Employer's Agent / Employer's Representative. The belts shall be driven via drive rollers using externally mounted variable speed drive (VSD) units controlled by a frequency inverter. The VSD shall be a vector control type and shall be installed in a controlled environment away from the belt press in a MCC room designed for that purpose.

The Gearbox and Motor shall comply with the Johannesburg Water (SOC) LTD's Particular Specifications M08 and the overall efficiency of drive assembly shall be 85% minimum.

M15.6.8 Belt Tensioner

Belt tensioning system shall be provided with necessary means of adjusting the upper and lower belt tension under all operating conditions. The upper and lower belt shall be capable of being adjusted separately with reference to operational conditions. Hydraulic belt tensioning system with a proven record of operation in similar wastewater environment is preferred unless specified otherwise in the project specification.

The Belt tensioning system shall have minimum and maximum value for belt tension adjustment required for belt tracking. The tensioning mechanism shall be designed to maintain set tension in case of component failure on one side of the belt, and also designed to provide positive protection against over tensioning.

The Belt tensioning system operation shall allow for manually adjustment of the belt during operation or with the belt stationary. A tension indicator shall be provided at each available point of belt adjustment. Protection shall be provided at the max and min position of the tensioning rollers for belt break detection and tensioning rollers for overload detection respectively.

M15.6.9 Belt Alignment/Tracking

A belt alignment system shall be provided to automatically control alignment of the belt on the rollers under all operational conditions. The tracking device shall not use any components which would lead to any belt edge deformation or wear. The belt tracking system shall be able to react to belt movement and take corrective action relative to belt 'drift'.

The belt tracking system shall comprise a sliding guide roller on each belt. The control mechanism shall not have excessive belt wrap angles around the guide roller, nor excessive sliding travel, which could lead to belt deformation and wear.

The slewing mechanism shall include a hydraulic linear actuator coupled directly to

the bearing housing on the slewing roller. The slewing bearing housing shall be provided with low-friction tracks.

At least two sensors shall be provided on each side of the belts. This shall be provided to sense a misalignment condition. The first set of sensors shall be used to initiate an alarm in the control panel and the second set shut down the belt presses with reference to approved operational philosophy.

M15.6.10 Emergency Switch

At least two (2) emergency switches or pushbuttons enclosed in a suitably protected, minimum IP65 panel pedestal shall be provided on either side of the belt press long the sections to isolate the entire belt press unit in accordance with the relevant standard and in compliance to Occupational Health and Safety ACT, 1993. All critical equipment shall be interlocked to these emergency switches and shall render an appropriate shutdown procedure as per the belt press operational philosophy without damaging any component of the belt press unit.

M15.6.11 General Fasteners

Nuts, bolts, studs and washers for incorporation in the Works shall conform to the requirement of the appropriate approved standard.

Bolts shall be of such standard length that a minimum of two up to maximum four complete threads shall protrude beyond the nut when in the fully tightened condition. The same shall applies to stud units. Mating surfaces shall be adequately protected against corrosion whilst awaiting assembly of the faces and bolting, all to the approval of the Employer's Agent or Employer's Representative.

All high tensile bolts and studs used in the Works shall bear the letter HTS stamped or engraved on the end.

Washers shall be provided under all bolt heads and nuts. The threads of bolts and studs shall be lubricated before assembly with a lubricating substance subject to the approval of the Employer's Agent or Employer's Representative. Washers, locking devices and anti-vibration arrangements shall be provided where necessary and shall be subject to the approval of the Employer's Agent or Employer's Representative.

Hot Dip Galvanised fasteners shall comply with the requirements of SANS 121.High strength friction grip (HSFG) bolts, nuts, load indicator washers and washers shall subject to the approval of the Employer's Agent or Employer's Representative and shall be hot dip galvanised. High strength friction grip bolts shall be tightened in accordance with the manufacturer's recommendations and the tension shall be re-checked not less than 3 hours after first tightening and then the bolts shall be retightened to the initial load all to the approval of the Employer's Agent or Employer's Representative.

Stainless steel bolts, nuts and washers shall be in accordance with SANS 1700 A70 and the grade of stainless steel shall be subject to the approval of the Employer's Agent or Employer's Representative.

All stainless steel holding down bolts, nuts and washers in contact with a dissimilar material shall be of stainless steel and provided with isolating washers and sleeves (insolating kit) where appropriate to prevent galvanic corrosion, unless otherwise specified in the project specification. The bed plates and machinery shall be provided with means of adjustment for line and level to maintain the items of Plant in correct alignment during grouting. Packers used for adjustment shall be of non-corrosive material to the approval of the Employer's Agent or Employer's Representative.

Holding down bolts which are to be tightened after grouting shall be provided with bond breakers where they pass through the grout.

Where there is a risk of corrosion, bolts and studs shall be designed so that the maximum stress in the bolt and nut does not exceed half of the yield stress of the bolt material under all conditions. The shear value of high-strength friction grip bolts shall be reduced in proportion to the reduced tensile stress compared with the normal design stress.

No tapped holes in mild steel shall be allowed. Where tapped holes are unavoidable, this shall be done into stainless steel.

Where bolts and nuts are required to be removed and re-assembled on a regular basis, these shall be of stainless steel.

Metal coatings and other treatments applied to fasteners shall be carried out in a manner which will not cause hydrogen embrittlement of the parent material.

M15.7 GEARBOX ASSEMBLIES

Refer to Particular Specification M08: Gearboxes for details.

M15.8 BELT PRESS ACCESS PLATFORM

M15.8.1 Specific Design Parameters

The objective of the belt press access stairs and Platforms shall be to gain access to the top of the belt press for cleaning and maintenance purposes.

The required access stairs and platform layout is specified in the project-specific specification and will comply with the following details.

Where cat ladders are used to access any portions of the belt press equipment, these shall be restricted to the main operational and maintenance staff only. This shall be achieved by using a lockable gate at the start of the cat ladder. This should be evaluated on a case by case by the Employer’s Agent or Representative based on the operational requirements.

M15.8.2 Platform

The platform shall be a minimum of 1200 mm in width and designed such that full access around the top of the belt press is possible. The platform shall be fitted with handrails and kick plates made from angles or flats that rise at least 100 mm above the platform. The handrails shall extend up from the access stairs and shall continue along the length of the platform and enclose the platform at the far edge.

M15.8.3 Handrails

Single handrails shall be provided on each side of the stairs, with a distance between them of no less than 750 mm centre to centre. Tubular hand and knee rails shall be made from steel tube with a thickness of no less than 2.5 mm. Joints shall be butted using tubular steel ferrules that shall be screwed and shall be located at points of minimum stress. Handrailing shall be prevented from rotating or moving longitudinally.

The steel tube shall be 34 mm outside diameter. Handrails shall be fabricated from hollow sections no less than 3 mm thick. The handrailing shall extend from the bottom stair up along the ladder, along the length of the platform and enclose the platform. All handrailing shall be constructed from hot dip galvanised materials, no cutting, drilling

and welding after items have been galvanised shall be allowed.

M15.8.4 Platform Support Frame

The access stairs and platforms shall be supported by a steel frame. The steel frame shall consist of a base and bracing designed to support the ladder and platform to prevent buckling. It is preferred that the support frame is independent from the belt press main frame. All platforms shall be constructed from hot dip galvanised materials, no cutting, drilling and welding after items have been galvanised shall be allowed.

The design of the platform shall be subject to the approval of the Employer's Agent/ Employer's Representative.

M15.8.5 Lifting Equipment

The design of the lifting equipment shall be with reference to the project specification requirement and shall be subject to the approval of the Employer's Agent/ Employer's Representative. If not specified in the project specification, the dewatering belt press shall be supplied under the same contract with a lifting crawl beam installed over the centre of the longest section of the belt press. The minimum safe working load shall be 1000 kg. The lifting equipment shall be designed and manufactured from corrosion-protected structural steel. Further equipment used to handle the components of the belt press shall be provided and selected with a lifting and operational study aligned with the location and orientation of the belt press workable space.

M15.9 PIPEWORK

The design of the wash water, sludge feed and drainpipe work shall comply with Particular Specification M21: Pipework. All pressure pipes on the belt press and sludge pipework shall be manufactured from 304L stainless steel. The sludge and polyelectrolyte pipe spools and fittings shall all be flanges (unless otherwise not practical) with the lengths kept minimal for access to remove any blockages that might arise.

M15.10 ELECTRICAL CONTROL PANEL

The filter belt press shall be supplied complete with an integral control panel and shall provide electrical interlocks and an indication of the following: -

- Belt track condition
- Belt misalignment protection system to prevent belts from being damaged.
- Broken belt detection
- Low flow or pressure of wash water
- Low or no flocculent supply
- Low or no sludge flow
- Manual stop/start
- Forward and reverse control facility on the belt drive to assist mechanical maintenance to replace belts. (This facility shall be available on the control panel)
- All of the necessary fault conditions within the belt filter press will cause damage, system failure or injury.
- The control panel shall have easy access in the front and back and have adequate lighting for maintenance purposes.
- All equipment supplied on the panel shall have a very high protection rating of IP66 for protection against ingress of water.
- The indication lamps must be the multi-cluster LED type for longer life.

- All protection systems and devices shall be clearly displayed on the SCADA in order to alert the relevant maintenance or process staff to the problems with the belt.
- A comprehensive list of alarms shall be displayed on the SCADA to alert process or maintenance personnel when a belt goes into a shutdown condition.
- An hour meter on the belt drive.
- The control panel shall further be linked to a PLC as follows: (THE PLC SHALL NOT BE IN THE CONTROL PANEL but in a controlled environment away from the belt presses in a PLC room designed for that purpose).
- The PLC must be supplied, installed and programmed in accordance with the JHB Water Standards for PLC hardware, PLC software and PLC panels.
- **The PLC control platform shall be custom design in line with requirements of the control philosophy, and NO on-board PLC will be accepted.**
- The PLC must be interfaced with either the master PLC in the MCC, which in turn must be interfaced with the existing plant SCADA, or the PLC must be interfaced directly with the existing plant SCADA if there is no master PLC.
- PLC/SCADA interfacing must be done via the existing network or by extending the existing network if required.
- The PLC shall be able to interface directly with the rest of the PLC Network using Ethernet protocol and not use converters installed on the network.
- The control of the belt press shall be done on the SCADA and not on the control panel, all adjustments of set points etc must be done on the SCADA.
- The control panel shall only be used for maintenance purposes and not to control the belt, all controls shall be done via the SCADA.
- The belt press shall have an electro-magnetic flow meter (mag flow) for measurement of instantaneous and totalised sludge, Poly and dilution water flows to the belt press. These flow meters shall comply with the Automation and Control Design Standards Volume 8: Flow measurement. The flow data (instantaneous flow and totalising pluses) from the flow meters shall be made available to the SCADA or the master PLC for ratio calculation and reporting purposes.

M15.11 ELECTRICAL MOTORS

The electrical motors shall be coupled to the gearboxes by means of a pin type flexible coupling.

The motors shall have an IP rating of at least IP 66 to prevent dust and water ingress in case of high-pressure wash water in the area of installation.

The motors shall be so installed that the terminal boxes are facing a direction that enhance the prevention of ingress of water and dust, provided that it is still accessible for maintenance purpose. The installation position shall be subject to the approval of the Employer's Agent/ Employer's Representative.

For a detailed specification for the electrical motors required refer to Particular Specification E01: Electric Motors

M15.12 INSTRUMENTATION

All control valves shall be electrical actuated.

All instrumentation such as control valves, magnetic flow meters shall comply with relevant Johannesburg Water (SOC) LTD particular specifications etc., shall have easy access for repairs and calibration.

M15.13 ACCESS, MAINTENANCE AND OPERATION

All the necessary safety guards shall be fitted as part of the belt press assembly in compliance to the Occupational Health and Safety ACT, 1993 & Regulations.

Access stairs, ladders and platforms adequate for safe operation, inspection and maintenance activities shall be provided. This shall include hand railing and kick plates.

The access platforms shall be supported to allow clear access underneath except where columns are positioned, and the height shall allow safe access to the press gravity dewatering area.

An overhead crawl beam as specified in the project specification shall be available for maintenance purposes. Access for maintenance from the top and from the sides shall be possible by easy removal of enclosure panels.

M15.14 MATERIAL OF CONSTRUCTION

The Filter Belt press components shall be constructed with the material specified below unless specified otherwise in the project specification. :

COMPONENT	MATERIAL TYPE
Filter belt press MAIN framework and MAIN covers	304L Stainless Steel
Sludge Pipework:	304L Stainless Steel
Gravity Flow (filtrate) Pipework	Class 9 uPVC
Internal piping	316L Stainless Steel
Inline-mixer	Aluminium cast
Sludge cake chutes and Belt discharge scraper:	304L Stainless Steel
Pressure Rollers	Mild steel Vestosint, Polyamide 12 Fluidized bed powder coating with the following minimum requirements: • Thickness of 1mm • Density of >440g/dm² • Shore Hardness D 75 • Ball Indentation Hardness 90N/mm²
Perforated rollers	Hot-dipped galvanised mild steel
Belt Supports:	304L Stainless Steel
Sludge ploughs	Epoxy Coated Gray cast iron to a minimum of 350 microns.
Spray wash system:	304L Stainless Steel
Filtrate Collection Trays	304L Stainless Steel
Wearing Bars	Polyurethane
All other accessories shall be of the manufacturer's standard, industry-approved, and corrosion-protected.	

M15.15 CORROSSION PROTECTION

Refer to Particular Specification G02: Corrosion Protection.

M15.16 COLOUR CODES

The standard final colour codes for equipment supplied under this Contract shall conform to Particular Specification G01: Colour Codes. The cost of painting shall be deemed to be included in the supply and delivery of the particular item supplied and installed under the Contract.

M15.17 RECOMMENDED SPARES AND SPECIAL TOOLS

The Tenderer must submit on the appropriate schedule a priced list of spare parts which is recommended to be kept by the water treatment plant for maintenance of the plant. Spares which the Client decides to order must be manufactured simultaneously with the rest of the equipment and be subject to the same tests for dimensions, tolerances, strength, etc. All spares must be packed separately, and the cases appropriately marked. All spares must be new and unused.

For special tools being used on offered equipment. Tenderers must submit a provisional price (where applicable) for a complete set of spanners, keys and tools required for the operation, adjustment and overhaul of the plant supplied. All spanners, keys and tools shall be new and unused.

M15.18 GUARANTEE OF PERFORMANCE

Tenders shall offer a guarantee on the performance of the filter belt press at the designed solids loading rate and system designed in the project specification. The guaranteed values shall be the dry solids content of the sludge cake production (% D.S. by mass), and the associated consumption (kg/t dry solids) of the polymer shall be provided with the offer. The tender shall provide a solid capture rate for the offered equipment which was form part of performance guarantee. A further parameter of measuring the total suspended solids in the filter belt press filtrate will be measured as a secondary quality check of the dewatering unit offered during the commissioning and trail operation stages.

This guaranteed data will be used to compare Tenderers over the life expectancy of the plant (15 years).

The Contractor shall prove the performance guarantee of the offered equipment with one calendar month of commissioning and five (5) calendar months of trial operation within a ±5% variation from the guaranteed performance. Trial Operation shall only commence once commissioning stage is complete and approved by the Employer's Agent / Employer's Representative.

Trial Operations Stage shall demonstrate that the equipment performs reliably and in accordance with the Contract over the specific period. Once the Trial Operation has commenced, the equipment shall be operated successfully for a minimum period of three (3) months continuously, with interruptions only to alter equipment settings, effect final settings and optimization, test auto-functionality and train the Employer in the final detail functioning of the equipment. During the Trial Operation Period, the Contractor shall record all operational data and on completion submit to the Employer's Agent / Employer's Representative a report confirming final settings, calibration, auto control functions and approved tests, all to the satisfaction of the Employer's Agent / Employer's Representative. Approval of the trail operation stage by the Employer's Agent / Employer's Representative shall signal approval of

equipment performance as guaranteed.

Should the filter belt press unit fail the performance test at the Works on the first attempts either during commissioning or trial operation, the Employer's Agent or Representatives may authorise any amendments to the plant which may be considered necessary to meet the guaranteed quantities within the permissible tolerances and allow for an opportunity for the Contractor to prove with further test that the equipment conform to the Specification. All costs involved in the re-testing and/or modification of the system of equipment units will be borne by the Contractor.

Should the equipment unit consistently or repeatedly fail to pass the test with more than ±20% variation on the actual guaranteed figures; the Employer's Agent or Representatives will reject the filter belt press unit and impose a penalty for non-compliance on the Contractor. The Contractor will be required to replace the unit so rejected with an alternative equipment so determined by the Employer's Agent or Representative available on the market.

Should the equipment until occasionally fail to pass the guaranteed performance test, but provide the actual figures with a variation (of special interest will be below the specified targets) between 5 to 20% from the actual guaranteed figures, the Employer's Agent or Representatives may: -

- Request the Contractor to carry out amendments to ensure the compliance of the unit with the Specification. The cost of amendments will be by the Contractor; Or
- Accept the equipment but impose a penalty for non-compliance on the Contractor. A sum will be calculated based on the final percentage deviation for each filter belt press equipment offered and this will be deducted from the Contract price for each filter belt press unit offered.

In the case of failure to meet guarantee polyelectrolyte consumption during the test period, by the cost of polyelectrolyte calculated to-be used on:

- The excess consumption rate determined during the test period;
- An average dry solid loading as specified in the Project Specification as dry tons per day;
- The current cost to the client of polyelectrolyte delivered on site;
- An operating period of 15 years, and;
- A discount rate of 6 per cent p.a.

The Defects Liability period shall be a minimum of 12 months calculated from the date stated in the Completion Certificate. However, should a portion or all of the plant and equipment fail / or require rectification during this period, the Employer's Agent or Employer's Representatives reserves the right to extend the Defects Liability Period in respect of such portion or all of the plant and equipment for a further period of at least 12 months calculated from the date of Commissioning of such plant and equipment after rectification.

M15.19 QUALITY MANAGEMENT (QM) AND QUALITY ASSURANCE (QA)

M15.19.1 General

QM shall be categorised as 'critical and major' for this section of the Project.

The Contractor's Quality Management System shall be in accordance with industry standard.

The Contractor shall implement a comprehensive Quality Control programme and accept full responsibility for the quality of his workmanship and material used, irrespective of any quality surveillance that may be carried out by the Employer's

Agent / Employer' Representative.

In keeping with the basic principles Quality Management System, the Contractor and Subcontractor(s) shall:

- Be responsible for compliance with all the requirements of the Specification in every respect;
- Carry out all inspections and tests called for in the Specification in the presence of the Employer's Agent / Employer' Representative. The cost of these inspections and tests shall be carried out at the sole expense and under the responsibility of the Contractor;
- Draft a Quality Control Plan for manufacture for approval by the Employer's Agent / Employer' Representative and comply with the approved Quality Plan during manufacturing process of all components indicating all the intended stages of testing during manufacture, cleaning and preparation for application as well as necessary hold points for independent quality surveillance;
- Draft a Quality Control Plan for corrosion protection for approval by the Employer's Agent / Employer' Representative and comply with the approved Quality Plan during corrosion protection process of all components indicating all the intended stages of testing during corrosion protection as well as necessary hold points for independent quality surveillance;
- Draft a Quality Control Plan for installation for approval by the Employer's Agent / Employer' Representative and comply with the approved Quality Plan during installation process of all components indicating all the intended stages of testing during installation as well as necessary hold points for independent quality surveillance; and
- Draft Quality Control Plans for any other construction process as may be required for approval by the Employer's Agent / Employer' Representative and comply with the approved Quality Plan during the execution of the process indicating all the intended stages of testing as well as necessary hold points for independent quality surveillance.

The Quality Control Plans will not be compromised once approved and shall be adhered to at all times. The Contractor shall operate approved quality assurance and control programmes in the Supplier's and Manufacturer's premises and on Site in order to verify that the Works comply with this Section. Prior to the commencement of any work, the Contractor shall prepare and submit to the Employer's Agent / Employer' Representative for approval, quality plans describing the procedures, standards of acceptance, hold point inspections, routine and type tests to be carried out for each component both during manufacture and on Site.

Although it shall remain the responsibility of the Contractor to ensure that the Works conform to the Specification, the Employer's Agent / Employer' Representative shall be entitled to inspect, examine and test the materials, workmanship and performance of every item of Plant. The Employer's Agent / Employer' Representative will notify the Contractor which tests or inspections, detailed in the quality plan, he will attend.

Approval by the Employer's Agent / Employer' Representative of materials, workmanship, etc., during manufacture or at Site will not relieve the Contractor of his obligations to comply with all the requirements of the Contract.

All instruments and appliances necessary for the complete inspection and testing shall be provided by the Contractor. Calibration certificates for instruments shall be produced to the Employer's Agent / Employer' Representative for review prior to the commencement of any tests and, if required by the Employer's Agent / Employer' Representative, instruments shall be re-calibrated at the Contractor's own account before commencement of the tests.

In general, Quality Management System should be bench marked in accordance with the relevant ISO 9001 requirements or similar industry acceptable standards

M15.19.2 Material Tests

The Manufacturer's material test data and the Contractor's quality records shall be subject to examination by the Employer's Agent / Employer' Representative. Reasonable samples of the cleaning and coating materials to be used may be taken for testing.

Rejection of the samples shall place a hold on the use of the materials of the same batch number and any components that have already been cleaned/coated with rejected material shall be re-cleaned and coated.

M15.19.3 Type Tests

Where the Contractor offers Plant selected from the standard range of products from a specialist manufacturer, type tests in accordance with a recognised international standard are required on one unit of each type to prove satisfactory design and quality of manufacture of that Plant.

The Employer's Agent / Employer' Representative may waive the requirement for type tests if he is satisfied that tests have previously been performed on identical Plant. The Contractor shall submit the data and results with his Quality Plan in sufficient time to allow for repeat tests without delaying the Works should the Employer's Agent / Employer' Representative not approve the evidence submitted.

M15.19.4 Quality Control Records

Accurate and detailed quality control records shall be kept by the Contractor for all stages of the work.

All the quality control records shall be available for inspection by the Employer's Agent / Employer' Representative.

The collection of record documents for each item of Plant shall be collated and bound in a logical manner and retained by the Contractor as proof of quality achieved. These shall be available on demand for quality control and part payment releases.

The records shall be neatly filed and handed over to the Employer's Agent / Employer' Representative. on completion of the work in the form of a Data Pack together with all relevant material and test certificates. Only after the Data Pack has been approved and signed off by the Employer's Agent / Employer' Representative. shall Plant be dispatched to Site.

M15.19.5 Substandard Quality Control

All material, certification and records of the Contractor shall be subject to examination by the Employer's Agent / Employer' Representative.

This shall include the checking and testing of the Plant at the Works and on Site, installation and pre-acceptance testing. If any deviation is found, additional testing and quality surveillance shall be carried out at the Contractor's own costs until approved by the Employer's Agent / Employer' Representative.

If the additional testing confirms inaccurate quality control by the Contractor on an item of Plant, all work shall be stopped on that item of Plant and shall only proceed after remedial action in the quality control system has been implemented.

M15.19.6 Access for Surveillance

For the purpose of carrying out quality surveillance, the Employer's Agent / Employer'

Representative shall be granted access to any part of the Contractor's premises relevant to the work being carried out, at any reasonable time.

M15.19.7 Manufacture

Tenderers shall submit with their tender a detailed Project Quality Plan, stating how they control the flow of paperwork from commencement of the Project through final handover to the Client, a sample of their Quality Control Plan, (QCP) and Project Quality Plan, (PQP) both during the course of the Project, manufacture and finally, installation.

The successful Tenderer shall submit a QCP covering all aspects of the manufacturing process, indicating held points to allow the Employer's Agent or Representative opportunities to evaluate the equipment for compliance to this specification.

All items of equipment shall be subject to inspections by the Employer's Agent or Representative during design and manufacture per these QCP's.

In general, it is anticipated that this Project shall be in accordance with the relevant ISO 9000 requirements or similar industry standards

M15.19.8 Installation

The successful Tenderer shall submit a QCP covering all aspects of the installation of each item of equipment to be installed under this Project. The Employer's Agent or Representative shall be afforded every opportunity to certain stages of completion of the installation to ascertain compliance with the Specifications and to witness the Contractor's site activities at the Employer's Agent or Representative's discretion.

M15.20 EQUIPMENT PERFORMANCE TESTING

M15.20.1 Works testing

All Equipment shall be subject to a Factory Acceptance Test (FAT) by the Manufacturer and witness by Employer's Agent / Employer' Representative at the Manufacturer's premises before despatch. All performance test results shall be made available to the Employer's Agent / Employer' Representative for verification or when the QCP's require intervention or hold points for inspection.

Equipment may only be despatch from factory once all relevant "hold points" on QCP's have been signed off by the Employer's Agent / Employer' Representative and/or the Approved Inspection Authority (AIA) in accordance with approved quality control plan

M15.20.2 Before commissioning

- The supplier specialist shall supervise and certify the installation of the belt press as per the correct installation instruction and issue a certificate of installation completion. The same specialist shall be present during the entire duration of the commissioning stage of each filter belt press unit.
- The Contractor along with the supplier specialist shall prepare and submit to the Employer's Agent or Representative a detail commissioning plan outlining the strategy, procedure and defining the criteria to demonstrate the performance of the equipment or system before any commissioning activities commences. The commission shall be based on a framework provided by the Employers Agent outlining the stages involved in the commissioning with a detail responsibility matrix agreed with the Client, Employers Agent/Representative and Contractor/Supplier. The plan shall outline also how

the new plant will be brought into the live system and the associated temporary work involved that will decommission, divert or modify existing systems in instances where the contract is on a live operational plant.

- Check that all bearings are greased and secured properly.
- Check that there is no debris or unwarranted items on the filter belt and rollers;
- Ensure that the belts are correctly tensioned
- Ensure all HD bolts are torqued down correctly with the allowable protruding threads of 2-4 threads.
- The alignment and levelling of all equipment shall be done.
- The electrical installation, functions and control shall be checked by a competent inspector prior to attempting to start any motor on this Project.
- Check the motor rotation and confirm with reference to process and instrumentation drawing.
- Check the electrical motor overload settings.

M15.20.3 <u>During Commissioning</u>

- Ensure all lubrication levels are sufficient. Check and record for baseline purposes for correct measurement of the impeller rotational speed, vibration and noise.
- Note amperage drawn by each motor assembly.
- Measure and record the performance of the equipment in line with the agreed performance guarantee discussed above in this document.

M15.21 BEFORE EXPIRY OF THE DEFECTS LIABILITY PERIOD

The Contractor has an obligation to visit the site every quarter to inspect for the correct operation of the installed equipment. A report after each visit shall be submitted in writing by the Contractor to the Employer's Agent or Representative within 14 days of the site visit.

M15.22 EQUIPMENT TRAINING PROCEDURE

Training shall be provided by the Contractor (or specialist equipment suppliers) based on the supplied and approved operation and maintenance (O&M) manuals for all supplied equipment. This training shall be provided to the Operations and Mechanical including other support discipline staff of the Employer along with the Employer's Agent and/or Representatives. The duration of the training period shall be a minimum of 128hours with the training content or curriculum agreed with the Employer's Agent and/or Representatives.

The training structure for the equipment and/or system shall include both the theory and practical components centred around the equipment and derived from the O&M manuals.

The preparation of the O&M manuals shall be based on the Johannesburg Water (SOC) Particular specification for Commissioning and Operation.

M15.23 OPERATION AND MAINTENANCE MANUAL SUMMARY

The Contractor shall hand over to the Employer' Agent or Employer's Representative four sets (x2 hard copies and x2 electronic copies on non-locked USB) of the Operation and Maintenance Manual compiled for each installation not later than at the time of commissioning of the installation. These manuals are a prerequisite for final takeover of the plant. A copy of the Operating and Maintenance Manual for each equipment type shall be bound in with the Operating and Maintenance Manual for the project. The manual shall be A4 size and properly bound. Drawings larger than A3 size shall be contained in separate plastic pockets.

The Operation and Maintenance Manual will contain the following:

M15.23.1 Operations Instructions;

- Brief description of the plant and installation as a system with the method(s) of operation described.
- General System or Process Safety Instructions indicating the following;
- Minimum PPE requirements
- • Risk, Health and Safety Assessment with proposed control measures Concise operating instructions indicating the following;
- Start up and Shut down modes
- Alarm and protection interlock condition and the associated settings
- Routing attention during operation
- Description of adjustable settings for the mode(s) of control i.e. operating envelopes

M15.23.2 Maintenance Instructions;

- The Contractor or the specialist vendor shall make allowances for Instructors to train the Client's O&M service personnel after the system has been commissioned and handed over.
- Routine for Preventative maintenance instructions with schedules for each unit or equipment
- Fault finding with detailed precautionary measures, elementary trouble location, rectifying measures and emergency actions this shall include failure mode analysis and preventative strategies.
- Detailed information and description on equipment installation, dismantling and handling.
- Lists of recommended spare parts including names and addresses of suppliers.
- Schematic Diagram and Drawings
- CoC's with calibration certificates, FAT, SAT, etc..

M15.24 DRAWINGS

The drawings included in the Tender Documents are the Employer's Agent or Employer's Representative. 's proposal for the plant layout. Should the Tenderer offer alternative layouts, they shall submit drawings with his Tender in order for it to be evaluated.

Before the Contractor carries out any work, he will submit detailed working drawings to be approved by the Employer's Agent or Employer's Representative. Approval of these drawings does not relieve the Contractor from his responsibility for the correctness of the drawings.

M15.25 INTERCHANGEABILITY

Where two or more similar types of equipment are required, these units will be identical in all respects.

All similar parts of items supplied will be interchangeable without any additional machining or fitting.

M15.26 MEASUREMENT AND PAYMENT

No separate payment will be made other than the specified equipment in the Bills of Quantifies unless otherwise specified in the detail specifications. Therefore, all direct and indirect costs associated with such equipment shall be deemed to be included in the rates tendered for the equipment as per each payment clause.

Where separate payment is required for each equipment specified in this document

and/or specified in the project specifications, the following payment items shall be applicable:

M15.26.1 General

The following items shall, inter alia, be included in the rates:

- Supply of all design and pre-manufacture documentation and obtaining approval thereof;
- Procurement/manufacture of the BFP with associated equipment items and delivery to Site;
- Installation of complete BFP with associated equipment items and testing;
- Services required during period of initial use before handover to the Employer.

Payment under scheduled items shall be made per complete installation as specified, electrical connections, etc and grouting, etc. Measurement and payment will distinguish between supply / delivery, installation, testing and commissioning and trail operation of the equipment.

M15.26.2 **Supply and delivery to site with documentation**

Item	**Unit**
Supply and delivery to site with documentation	No

The tendered rates shall include for full compensation of all costs incurred in design, drawings, manufacture, supply, testing at the manufacturers works, inspections, quality control, quality assurance, factory acceptance testing, corrosion protection, packing, delivery to site and offloading on site. No claims whatsoever for extras will be allowed on the grounds that a necessary piece of equipment or a part thereof is not specifically mentioned.

M15.26.3 **Installation, Testing and Commissioning of the Equipment**

Item	**Unit**
Installation, Testing and Commissioning of the Equipment	No

The tendered rates shall include for full compensation of all costs incurred in installation, site testing, setting into operation, the supply of O & M manuals, commissioning and maintenance during the warranty period of all equipment specified on Site including the provision of all labour, supervision, instruments, equipment, transport, on-site quality assurance and quality control, inspection and testing (including attendance at tests witnessed by the Employer's Agent / Employer' Representative), materials and Temporary Works necessary to completely install, test and commission and render fully operational filter press equipment.

The rate shall also include the cost of the installation of all auxiliary equipment not specifically mentioned but obviously required, (e.g. all ancillaries, including all bolts, fastenings and brackets, safety guards and any work or material required for the proper installation of such equipment) to enable the equipment to be installed and/or function safely and correctly as specified until taken over by the Employer; the putting into service of the complete installation; remedial work and any other work as specified and necessary.

The rate shall also include for all preliminary testing and the provision of testing equipment therefore including all disruptions to installation caused by such testing. Payment will only be effected after full compliance of the equipment items with this Section and associated documentation has been approved by the Employer's Agent / Employer' Representative.

M15.26.4 **Trail Operations**

Item	Unit
Trail Operations	No

This specification allows for a number of calendar days within which the system Trial Operation can be completed after completion of commissioning process. The Contractor shall programme and price for providing full technical and operational support during trail operation.

M15.26.5 **Training**

Item	Unit
Training	No

Payment for Training of Operational Staff will be made under this Section as set out in project specification or agreed with the Employer's Agent / Employer' Representative. The lump sum shall be inclusive of all costs associated with the training programme and on-site training of personnel.

M15.26.6 **Spares**

Item	Unit
Spares	No

The cost of spares, considered to be necessary by the Contractor other than spares required by the Employer, delivered to Site and handed over will be paid as a lump sum. A Spare Part Schedule subject to approval by the Employer's Agent/ Employer's representative shall be submited before procurement of spares.

The actual lump sum to be paid shall be based on the unit rates priced in the Bill of Quantity for the actual spares ordered and supplied and the Employer is entitled to purchase all, some or none of the items listed. A provisional sum will be allocated in the Bill of Quantity for the complete list of spare parts as listed by the Contractor.

The rate tendered shall provide for the manufacture, supply, delivery to Site and handing over of the spares ordered and shall include permanent packing for long term storage. The spares shall be manufactured at the same time as the installed items.

----------**END**----------