TENDER NO. 13/2026	LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA	
Approved by Supply Chain Manager	Version: 00	

CONTRACT DOCUMENT

FOR THE

UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1

VOLUME 1: RETURNABLE DOCUMENT

NOTE:

- The Form of Offer and Acceptance (C1.1) is on **page 92** of this document
- Table 1: Preference Schedule (B-BBEE contribution) is on **page 75** of this document

APRIL 2026

Name of Tenderer	
Address (Physical)	
Contact Person	
Contact Number	
Email Address	
Amount (15% VAT Included)	
B-BBEE Status	
Duration (weeks)	

ISSUED BY:

LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

THE MUNICIPAL MANAGER
LANGEBERG MUNICIPALITY
28 MAIN ROAD
ASHTON
6715
Tel: (023) 615 8000

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

TENDER 13/2026

Tenders are hereby requested for the **UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1,** as specified in the bid document. Completed Bids, in sealed envelopes, clearly marked **TENDER 13/2026 UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1,** should be placed in the tender box, at the Langeberg Municipal Office, 28 Main Road, Ashton, not later than **12:00 on 24 APRIL 2026** when the Bids will be opened in public. Late, faxed or e-mailed tenders will not be considered.

Tenderers must be registered with the CIDB in a class of construction works and have a grading designation equal to or higher than that determined in accordance with the sum tendered or a value determined in accordance with regulation 25 (7A) of the Construction Industry Development Regulations, 2004. It is estimated that tenderers will need a grading designation of 6CE/6ME OR HIGHER,

COMPULSORY CLARIFICATION MEETING:
A COMPULSORY CLARIFICATION MEETING WILL BE HELD ON 1 APRIL 2026 AT 11H00, AT THE LANGEBERG MUNICIPAL OFFICES, 52 KERK STREET, ROBERTSON. NO LATE COMERS WILL BE ADMITTED AFTER 11H05.

PLEASE NOTE:
The official Bid document must be fully completed in black ink, all pages must be returned and the document should preferably be stapled or bound. Supporting documents must be submitted separately and must be stapled or bound. The Langeberg Municipality may appoint “reserve bidders” and award the bid to the second – or third ranked bidder during the adjudication stage if the highest-scoring bidder fails to perform during contract execution.

The lowest, or any tender, will not necessarily be accepted and council reserves the right to accept any tender. Tenders will be evaluated according to the Council’s Supply Chain Management Policy and the 80/20 Preference Point system. The Supply Chain Management Policy can be viewed at Municipal Offices or www.langeberg.gov.za

A minimum functional assessment score of 70 points will apply to this contract

Bid documents are available from **20 MARCH 2026**, on the Langeberg Municipal website: www.langeberg.gov.za
Please refer written enquiries to MR N ALBERTYN nalbertyn@langeberg.gov.za

DP LUBBE
MUNICIPAL MANAGER
Private Bag X2,
Ashton, 6715

LANGEBERG MUNICIPALITY

TENDER 13/2026

UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1

General Tender Information

TENDER ADVERTISED	:	20 March 2026
ESTIMATED CIDB CONTRACTOR GRADING DESIGNATION	:	6CE/6ME or higher
SITE VISIT/CLARIFICATION MEETING	:	1 April 2026 at 11h00
VENUE FOR SITE VISIT/ COMPULSORY CLARIFICATION MEETING	:	Langeberg Municipal Offices, 52 Kerk Street, Robertson
CLOSING DATE	:	24 April 2026
CLOSING TIME	:	12h00
TENDER BOX & ADDRESS	:	The Bid Box, at the Entrance of Municipal Office, 28 Main Road, Ashton, LANGEBERG Municipality.
	:	The Tender Document (which includes the Form of Offer and Acceptance) completed in all respects, plus any additional supporting documents required, must be submitted in a sealed envelope with the name and address of the tenderer, the tender No. and title and the closing date indicated on the envelope. The sealed envelope must be inserted into the appropriate official tender box before closing time at 12h00. If the tender offer is too large to fit into the abovementioned box or the box is full, please enquire at the reception for alternative instructions. The onus remains with the tenderer to ensure that the tender is placed in either the original box or as alternatively instructed.

TENDERERS MUST NOTE THAT WHEREVER THIS DOCUMENT REFERS TO ANY PARTICULAR TRADEMARK, NAME, PATENT, DESIGN, TYPE, SPECIFIC ORIGIN OR PRODUCER, SUCH REFERENCE SHALL BE DEEMED TO BE ACCOMPANIED BY THE WORDS "OR EQUIVALENT"

PART A (MBD1)
INVITATION TO BID

THE FOLLOWING PARTICULARS MUST BE FURNISHED (FAILURE TO DO SO WILL RESULT IN YOUR OFFER BEING DISQUALIFIED)

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE LANGEBERG MUNICIPALITY					
BID NUMBER:	13/2026	**CLOSING DATE**:	24 April 2026	**CLOSING TIME:**	12h00
DESCRIPTION:	UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1				
THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FILL IN AND SIGN A WRITTEN CONTRACT FORM.					

BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX SITUATED AT:
ENTRANCE OF THE MUNICIPAL OFFICES 28 Main Road Ashton 6715

SUPPLIER INFORMATION			
NAME OF BIDDER			
POSTAL ADDRESS			
STREET ADDRESS			
TELEPHONE CODE & NUMBER			
CELL PHONE NUMBER			
FACSIMILE CODE & NUMBER			
E-MAIL ADDRESS			
VAT REGISTRATION NUMBER			
TAX PIN		TAX REFERENCE NUMBER	
CSD No			
ORIGINAL AND VALID TAX CLEARANCE CERTIFICATE / TSC PIN SUBMITTED? YES☐ NO☐			
A B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE MUST BE SUBMITTED IN ORDER TO QUALIFY FOR PREFERENCE POINTS FOR B-BEE. NOTE A CERTIFIED COPY OR ORIGINAL IS COMPULSORY			
B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE SUBMITTED? (MBD 6.1) YES☐ NO☐ IF YES, WHO WAS THE CERTIFICATE ISSUED BY? (Tick applicable box) A VERIFICATION AGENCY ACCREDITED BY SOUTH AFRICAN NATIONAL ACCREDITATION SYSTEM (SANAS) ☐ or A SWORN AFFIDAVIT FOR EME'S AND QSE'S ☐			
RECENT MUNICIPAL ACCOUNT OF COMPANY (NOT OLDER THAN 90 DAYS) **MUST** BE ATTACHED			
RECENT MUNICIPAL ACCOUNTS OF ALL THE DIRECTORS/ SHAREHOLDERS **MUST** BE ATTACHED			
IF LEASING/RENTING/LODGING – ATTACHED LATEST VALID COPY OF AGREEMENT **IF NO PROPERTY REGISTERED IN YOUR NAME SUBMIT AN AFFIDAVIT CONFIRMING THIS.**			

BID PRICE OFFERED **NB: NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE** **(see definition on MBD 4 attached)**	
TOTAL BID PRICE (INCL 15% VAT)	

ANY ENQUIRIES REGARDING THE BIDDING PROCEDURE MAY BE DIRECTED TO:

LANGEBERG MUNICIPALITY
Contact Person: Mr N. Albertyn
Tel: 023 626 8200
Fax: 023 615 1563
E-mail: nalbertyn@langeberg.gov.za

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

YOURS FAITHFULLY,

DP LUBBE
MUNICIPAL MANAGER
MUNICIPAL OFFICES
PRIVATE BAG X2
ASHTON
6715

TEL: 023 626 8200

PART B (MBD 1)
TERMS AND CONDITIONS FOR BIDDING

1. BID SUBMISSION:

1.1 BIDS MUST BE DELIVERED BY THE STIPULATED TIME TO THE CORRECT ADDRESS. LATE BIDS WILL NOT BE ACCEPTED FOR CONSIDERATION.
1.2 **ALL BIDS MUST BE SUBMITTED ON THE OFFICIAL FORMS PROVIDED – (NOT TO BE TYPED) OR ONLINE**
1.3 THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT AND THE PREFERENTIAL PROCUREMENT REGULATIONS, 2022, THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT.

2. TAX COMPLIANCE REQUIREMENTS

2.1 BIDDERS MUST ENSURE COMPLIANCE WITH THEIR TAX OBLIGATIONS.
2.2 BIDDERS ARE REQUIRED TO SUBMIT THEIR UNIQUE PERSONAL IDENTIFICATION NUMBER (PIN) ISSUED BY SARS TO ENABLE THE ORGAN OF STATE TO VIEW THE TAXPAYERS PROFILE AND TAX STATUS.
2.3 APPLICATION FOR THE TAX COMPLIANCE STATUS (TCS) CERTIFICATE OR PIN MAY ALSO BE MADE VIA E-FILING. IN ORDER TO USE THIS PROVISION, TAXPAYERS WILL NEED TO REGISTER WITH SARS AS E-FILERS THROUGH THE WEBSITE WWW.SARS.GOV.ZA
2.4 FOREIGN SUPPLIERS MUST COMPLETE THE PRE-AWARD QUESTIONNAIRE IN PARAGRAPH 3 BELOW
2.5 BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID.
2.6 IN BIDS WHERE CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED; EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER.
2.7 WHERE NO TCS IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD), A CSD NUMBER MUST BE PROVIDED.

3. QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS

3.1	IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)?	☐ YES ☐ NO
3.2	DOES THE ENTITY HAVE A BRANCH IN THE RSA?	☐ YES ☐ NO
3.3	DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA?	☐ YES ☐ NO
3.4	DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA?	☐ YES ☐ NO
3.5	IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION?	☐ YES ☐ NO

IF THE ANSWER IS "NO" TO ALL OF THE ABOVE, THEN IT IS NOT A REQUIREMENT TO REGISTER FOR A TAX COMPLIANCE STATUS SYSTEM PIN CODE FROM THE SOUTH AFRICAN REVENUE SERVICE (SARS) AND IF NOT REGISTER AS PER 2.3 ABOVE.

NB: FAILURE TO PROVIDE ANY OF THE ABOVE PARTICULARS MAY RENDER THE BID INVALID.
NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

CHECK LIST

This list is to assist all bidders to submit complete proposals. Bidders are to check the following points before the submission of their proposals:		
1	All pages of the document have been read by the contractor and initialled.	☐
2	Any discrepancy and/or misunderstanding is cleared with the relevant officials.	☐
3	All pages requiring information have been **completed in black ink.**	☐
4	The Schedule of Quantities has been checked for arithmetic correctness.	☐
5	Totals from each sub section of the Schedule of Quantities have been carried forward to the summary page and done so correctly.	☐
6	The total from the summary page has been carried forward to the Form of Offer.	☐
7	Surety details where applicable have been included in the proposal.	☐
8	All sections requiring information have been completed.	☐
9	Bidder ensured that all documents is properly completed and signed	☐
10	The contractor has complied with the proposal prerequisites.	☐
11	The document is submitted before 12h00 on the due date at the designated bid box of Langeberg Municipality.	☐

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

LANGEBERG MUNICIPALITY

TENDER NO. 13/2026

UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1

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LANGEBERG MUNICIPALITY

TENDER NO. 13/2026

UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1

T1.1 Tender Notice and Invitation to Tender

LANGEBERG MUNICIPALITY | UMASIPALA | MUNISIPALITEIT
Private Bag X2, Ashton, 6715
☎ (023) 615 8000 🖷 (023) 615 1563 @ nalbertyn@langeberg.gov.za
www.langeberg.gov.za

TENDER NOTICE AND INVITATION TO BID			
DEPARTMENT INFRASTRUCTURE			
ADVERTISED IN	MUNICIPAL WEBSITE, DIE BURGER		
BID NO:	13/2026	**PUBLISHED DATE:**	20 March 2026
Bids are hereby invited for (Tender Description)	UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1		
Closing Time and Date	No later than 12H00	On the Date	24 April 2026
Compulsory Site Meeting	1 April 2026 at 11h00 at Langeberg Municipal Offices, 52 Kerk Street, Robertson		**CIDB GRADING**: 6CE/6ME or higher
Bids will be opened immediately thereafter, in public at the Council Chambers of LANGEBERG Municipality, 28 Main Road, Ashton.			
AVAILABILITY OF BID DOCUMENTS			
Tender Documents will be downloadable only form www.langeberg.gov.za			
Date Available	20 March 2026		

BID RULES

a. Bids are to be completed in accordance with the conditions and bid rules contained in the bid document and supporting documents must be placed in a sealed envelope and externally endorsed WITH THE NAME AND ADDRESS OF THE TENDERER, THE TENDER NO. AND TITLE AND THE CLOSING DATE, and be deposited in the Bid Box, at the Supply Chain Management Unit, Langeberg Municipality, 28 Main Street, Ashton.

b. Bids may only be submitted on the bid documentation issued by the Municipality.

c. The Langeberg Municipality does not bind itself to accept the lowest or any tender and reserves the right to accept any tender, as it may deem expedient. Tenders will be evaluated according to the Council's Supply Chain Management Policy and the 80/20 Preference Point system. The Supply Chain Management Policy can be viewed at Municipal Offices or www.langeberg.gov.za

d. Tenderers who are not yet registered are required to register on the Central Supplier Database (CSD). Online registration to be completed on the CSD registration platform, website https://secure.csd.gov.za.

e. Pre-qualification criteria for preferential procurement is applicable to the tender.

Tenders shall be evaluated in terms of the latest Langeberg Municipality Supply Chain Management Policy and the Preferential Procurement Regulations.		**Bidders may claim preference points in terms of their B-BBEE status level of contribution.**	
Preferential Procurement Point System Applicable	80/20	**Local Content Requirement**	N/A
Compulsory site Meeting/ Information Session	Yes	**Validity Period**	120 days

TECHNICAL ENQUIRIES: Ms M Lyners monique@lyners.co.za		**BIDDING PROCEDURE REQUIREMENTS & ENQUIRIES:** Mr N. Albertyn nalbertyn@langeberg.gov.za	
Section	Consulting Engineers	**Section**	Supply Chain Management
Contact Person	Ms M Lyners	**Contact Person**	Mr S Ngcongolo -
Tel:	E-mail Enquiries Only	**Tel:**	E-mail Enquiries Only
E-mail	monique@lyners.co.za	**E-mail**	SNgcongolo@langeberg.gov.za

Authorised by:
DP LUBBE
MUNICIPAL MANAGER
NOTICE NR: T40/2023

Private Bag X2
ASHTON, 6715
TEL: 023 626 8000

T1.2 Tender Data

The conditions of tender are the Standard Conditions of Tender as contained in Annex C of Government Gazette No. 42622 of 8 August 2019, Construction Industry Development Board (CIDB) Standard for Uniformity in Construction Procurement. (see www.cidb.org.za) which are reproduced without amendment or alteration for the convenience of tenderers as an Annex to this Tender Data.

The Standard Conditions of Tender make several references to the Tender Data for details that apply specifically to this tender. The Tender Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the standard conditions of tender. Each item of data given below is cross-referenced to the clause in the Standard Conditions of Tender to which it mainly applies.

The following variations, amendments and additions to the Standard Conditions of Tender as set out in the Tender Data below shall apply to this tender:

Clause number	**Tender Data**
C.1	**General**
C.1.1	Actions
C.1.1.1	*Add the following:* **The parties agree that this tender, its evaluation and acceptance and any resulting contract shall also be subject to the Employer's Supply Chain Management Policy ('SCM Policy') that was applicable on the date the tender was advertised, save that if the Employer adopts a new SCM Policy which contemplates that any clause therein would apply to the contract emanating from this tender, such clause shall also be applicable to that contract. Please refer to this document contained on the Employer's website.** **Abuse of the supply chain management system is not permitted and may result in the tender being rejected, cancellation of the contract, restriction of the supplier, and/or the exercise by the Employer of any other rights and remedies available to it as described in the SCM Policy.** The Employer is the LANGEBERG MUNICIPALITY, represented by Ms M Lyners as the Employer's Agent.
C.1.2	Tender Documents *Add the following:* **The following documents form part of this contract:** **VOLUME 1:** The Tender Document issued by the employer (this document), in which is bound: **THE TENDER** **Part T1: Tendering Procedures** T1.1 Tender notice and invitation to tender T1.2 Tender data **Part T2: Returnable Documents** T2.1 List of returnable documents T2.2 Returnable schedules **THE CONTRACT** **Part C1: Agreements and contract data** C1.1 Form of Offer and Acceptance C1.2 Contract Data

C1.3 Form of Performance Guarantee
C1.4 Occupational Health and Safety Agreement
C1.5 Form of Advance Payment Guarantee
C1.6 Insurance Broker's Warranty

Part C2: Pricing Data
C2.1 Pricing Assumptions
C2.2 Bills of Quantities

Part C3: Scope of Works
C3.1 Description of the Works
C3.2 Engineering
C3.3 Procurement
C3.4 Construction
C3.5 Management
C3.6 Mechanical
C3.7 Electrical
C3.8 Temporary Works
C3.9 Civil Particular Specifications
C3.10 Annexures

Volume 1 is deemed the "Returnable Document" which must be returned to the Employer in terms of submitting a tender offer.

In addition to the above, the following further documents are part of the tender:

VOLUME 2: The International Federation of Consulting Engineers (FIDIC) conditions of Contract for Construction (Second Edition) 2017 reprinted 2022 with amendments (Red Book). This publication is available, and tenderers must obtain copies at their own cost from the South African Institution of Civil Engineering (SAICE), Private Bag X200, Halfway House 1685, Tel: (011) 805 5947, Fax: (011) 805 5971, e-mail: civilinfo@saice.org.za.

VOLUME 3: The SANS Standardised Specifications for Civil Engineering Construction prepared by Standards South Africa. These publications are available, and tenderers must obtain copies at their own cost from Standards South Africa, Private Bag X191, PRETORIA, 0001.

Volumes 2 & 3 may also be inspected, by appointment, at the offices of the Employer's agent during normal office hours.

C.1.4 Communication and Engineer
Delete the first sentence of the clause and replace with the following:
Verbal or any other form of communication, from the Employer, its employees, agents or advisors during site visits/clarification meetings or at any other time prior to the award of the Contract, will not be regarded as binding on the Employer, unless communicated by the Employer in writing to suppliers by its Municipal Supply Chain Manager or his nominee.

The Employer's agent is:
Company: Neil Lyners & Associates (Pty) Ltd
Name: M Lyners
Address: South Gate Building, Ground Floor, Carl Cronje Drive, Tyger Waterfront, 7530
Tel: 021 914 0300
E-mail: monique@lyners.co.za

C.1.5 Cancellation and Re-Invitation of Tenders

Remove C.1.5.1, C.1.5.2 & C.1.5.3 and replace with the following:
C.1.5.4.1 In the event that, in the application of the 80/20 preference point system as stipulated in the tender documents, all tenders received exceed the estimated Rand value of R50 000 000, the tender invitation must be cancelled.

C.1.5.4.2 In the event that, in the application of the 90/10 preference point system as stipulated in the tender documents, all tenders received are equal to, or below R50 000 000 the tender must be cancelled.

C.1.5.4.3 An organ of state which has cancelled a tender invitation as contemplated in sub-regulations (1) and (2) must re-invite tenders and must, in the tender documents stipulate the preference point system to be applied.

C.1.5.4.4 An organ of state may, prior to the award of a tender, cancel a tender if -

a) due to changed *circumstances, there is no longer need for the goods or services tendered for; or*

b) funds are no longer available to cover the total envisaged expenditure; or

c) no acceptable tenders are received.

C.1.6.2 Competitive negotiation procedure
Add the following between C.1.6.2 and C.1.6.2.1:
*A competitive ne*gotiation procedure will **not** be followed.

C.1.6.3 Proposal procedure using the two-stage system
Add the following between C.1.6.3 and C.1.6.3.1:
A two-stage system *will* **not** be followed.

Add the following Clauses (C.1.6.4, C1.7) after Clause C.1.6.3 and before clause C.2.

C.1.6.4 Objections, complaints, queries and disputes/ Appeals in terms of Section 62 of the Systems Act/ Access to court

C.1.6.4.1 Disputes, objections, complaints, and queries
In terms of *Regulations* 49 and 50 of the Local Government: Municipal Finance Management Act, 56 of 2003 – Municipal Supply Chain Management Regulations (Board Notice 868 of 2005):

a) Persons aggrieved by decisions or actions taken by the ***Langeberg Municipality*** in the implementation of its supply chain management system, may lodge within 14 days of the decision or action, a written objection or complaint or query or dispute against the decision or action.

C.1.6.4.2 Appeals

a) In terms of Section 62 of the Local Government: Municipal Systems Act, 32 of 2000 a person whose rights are affected by a decision taken by the ***Langeberg Municipality***, may appeal against that decision by giving written notice of the appeal and reasons to the Municipal Manager within 21 days of the date of the notification of the decision.
b) An appeal must contain the following:
   i) Must be in writing
   ii) It must set out the reasons for the appeal
   iii) It must state in which way the Appellant's rights were affected by the decision;
   iv) It must state the remedy sought; and
   v) It must be accompanied with a copy of the notification advising the person of the decision
c) The relevant ***Langeberg Municipality*** appeal authority must consider the appeal and **may confirm, vary or revoke** the decision that has been appealed, but no such revocation of a decision may detract from any rights that may have accrued as a result of the decision.

C.1.6.4.3 Right to approach the courts and rights in terms of Promotion of Administrative Justice Act, 3 of 2000 and Promotion of Access to Information Act, 2 of 2000
The sub-clauses *above* do not influence any affected person's rights to approach the High Court at any time or its rights in terms of the Promotion of Administrative Justice Act and Promotion of Access to Information Act.

C.1.6.4.4 All requests referring to sub clauses C.1.6.4.1; C.1.6.4.2 and C.1.6.4.3 must be submitted in writing to:
The Municipal Manager - Langeberg Municipal Offices
Via hand delivery at: Langeberg Municipality, 28 Main Street, Ashton
Via post at: Private Bag X2, Ashton, 6715
Via fax at: (023) 615 1563
Via email at: mm@langeberg.gov.za

C.1.7 National Treasury Web Based Central Supplier Database (CSD) Registration
Tenderers are required to be registered on the National Treasury Web Based Central Supplier Database (CSD) as a service provider. Tenderers must register as such upon being requested to do so in writing and within the period contained in such a request, failing which no orders can be raised or payments processed

from the resulting contract. In the case of Joint Venture partnerships this requirement will apply individually to each party of the Joint Venture.

Tenderers who wish to register on the National Treasury Web Based Central Supplier Database (CSD) may do so via the web address **https://secure.csd.gov.za**.

It is each tenderer's responsibility to keep all the information on the National Treasury Web Based Central Supplier Database (CSD) updated.

C.2 Tenderer's obligations

C.2.1.1 *Delete the content of this clause and replace with the following:*
Tenderers must submit a tender offer that complies in all aspects to the conditions as detailed in this document. Only those tenders that comply in all aspects with the tender conditions, specifications, pricing instructions and contract conditions will be declared responsive.

Add the following clauses after C.2.1.2 and before C2.2:

C.2.1.3 Only those tender submissions from which it can be established that a clear and unambiguous offer has been made to Employer, by whom the offer has been made and what the offer constitutes, will be declared responsive.

C.2.1.4 Only those tenders that satisfy the following criteria will be declared responsive:

C.2.1.4.1 Construction Industry Development Board (CIDB) Registration
Only those tenderers *who* are registered with the CIDB, or capable of being so prior to the evaluation of submissions, in a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the sum tendered, or a value determined in accordance with Regulation 25 (1B) or 25 (7A) of the Construction Industry Development Regulations, for a CE or GB class of construction work, are eligible to have their tenders evaluated. Tenderers must obtain such active status upon being requested to do so in writing and within the period contained in such a request, failing which their tenders will be declared non-responsive.

Joint Ventures are *eligible* to submit tenders provided that:

a) every member of the joint venture is registered with an active status with the CIDB;
b) the lead partner has a contractor grading designation of not lower than one level below the required grading designation in the 6CE/6ME or higher class of construction work; and
c) the combined contractor grading designation calculated in accordance with the Construction Industry Development Regulations is equal to or higher than a contractor grading designation determined in accordance with the sum tendered for a CE class of construction work or a value determined in accordance with Regulation 25 (1B) or 25 (7A) of the Construction Industry Development Regulations.

Contractor grading designations and associated parameters as follows:

Contractor Grading Designation	Tender Value Range designation	Maximum value of contract that a contractor is considered capable of performing (R)
1 (class of construction works)	1	500 000
2 (class of construction works)	2	1 000 000
3 (class of construction works)	3	3 000 000
4 (class of construction works)	4	6 000 000
5 (class of construction works)	5	10 000 000
6 (class of construction works)	6	20 000 000
7 (class of construction works)	7	60 000 000
8 (class of construction works)	8	200 000 000
9 (class of construction works)	9	No Limit

For more details on classes of construction work refer to the CIDB website.

C.2.1.4.2 Compliance with requirements of LANGEBERG MUNICIPALITY SCM Policy and procedures

Only those tenders that are compliant with the requirements below will be declared responsive:

a) A completed **Compulsory Enterprise Questionnaire** to be provided (applicable schedule to be completed);
b) A completed **Certificate of Authority for Companies/Partnerships/Joint Ventures/Consortiums** to be provided authorising the tender to be made and the signatory to sign the tender on the partnership /joint venture/consortium's behalf (applicable schedule to be completed);
c) A copy of the partnership / joint venture / consortium agreement to be provided;
d) A completed **Declaration of Interest – State Employees** to be provided and which does not indicate any non-compliance with the legal requirements relating to state employees (applicable schedule to be completed);
e) A completed **Declaration – Conflict of Interest** and **Declaration of Bidder's past Supply Chain Management Practices** to be provided and which does not indicate any conflict or past practises that renders the tender non-responsive based on the conditions contained thereon (applicable schedules to be completed);
f) A completed **Certificate of Independent Bid Determination** to be provided and which does not indicate any non-compliance with the requirements of the schedule (applicable schedule to be completed);
g) The tenderer (including any of its directors or members), has not been restricted in terms of abuse of the Supply Chain Management Policy;
h) The tenderer's tax matters with SARS are in order, or the tenderer is a foreign supplier that is not required to be registered for tax compliance with SARS;
i) The tenderer is not an advisor or consultant contracted with the Employer whose prior or current obligations creates any conflict of interest or unfair advantage;
j) The tenderer is not a person, advisor, corporate entity or a director of such corporate entity, involved with the bid specification committee;
k) A completed Authorisation for the Deduction of Outstanding Amounts Owed to the Langeberg Municipality to be provided and which does not indicate any details that renders the tender non-responsive based on the conditions contained thereon (applicable schedules to be completed);
l) The tenderer (including any of its directors or members), has not been found guilty of contravening the Competition Act 89 of 1998, as amended from time to time;
m) The tenderer (including any of its directors or members), has not been found guilty on any other basis listed in the SCM Policy.

C.2.1.4.3 Minimum score for functionality based on a pre-qualification inspection

Please note that points scored for Quality (functionality) will not have an influence on the total tender evaluation points and will therefore not affect the ranking of the tenderers, it will only be regarded as a pre-qualification. The minimum points required to be eligible to tender is 70 out of a 100.

THE CRITERIA to be applied in evaluating the proposal is set out in the table below:

Calculate the points for functionality according to the following formula:

$$P_s = S_o/M_s \times A_p$$

Where P_s = Percentage scored for functionality by bid under consideration
S_o = Total score of bid/proposal under consideration
M_s = Maximum possible score = 500
A_p = percentage allocated for functionality = 100

Total points by bidder on functionality:

i) $P_{s(Criterion\ 1)}$ = (Indicator allocated/scored out of 5) x weight
ii) $P_{s(Criterion\ 2)}$ = (Indicator allocated/scored out of 5) x weight
$P_{s(TOTAL)} = [(P_{s(Criterion\ 1)} + P_{s(Criterion\ 2)}) / 5] \times 100$

Criteria can be amended to suit project complexity or omitted if not applicable.

Criterion	Weight
1) Relevant Experience (Returnable Schedule 14)	50%
2) Construction manager Experience (Returnable Schedule 15)	50%
Total	**100%**

EVALUATION CRITERION 1

Tenderers must have successfully **completed** (please note that current projects will not be included in the evaluation) at least 5 projects of a similar scope and nature in the last 10 years to score full marks on this criterion. Refer to the table below for a measurement of how points will be awarded against this criterion.

A detailed list of successfully completed projects must be completed in/attached to **Schedule 14**.

Projects of a similar scope and nature is regarded as:

- Pump stations with a capacity of 100ℓ/s or greater
- Water/Wastewater Treatment Works with a capacity of 1Mℓ/d or greater

Please note that no tenderer will be contacted to clarify any experience or construction equipment, or plant submitted with this bid. If insufficient information is shown, the tenderer will not be contacted for clarification.

1. RELEVANT EXPERIENCE	
INDICATOR	**Evaluation Criteria for Relevant Experience:** (number of similar projects completed by the contractor in the last 10 years)
0	The tenderer has completed zero projects in the last 10 years
1	The tenderer has completed only 1 project in the last 10 years
2	The tenderer has completed exactly 2 projects in the last 10 years
3	The tenderer has completed exactly 3 projects in the last 10 years
4	The tenderer has completed exactly 4 projects in the last 10 years
5	The tenderer has completed 5 or more projects in the last 10 years

EVALUATION CRITERION 2

Detailed, project specific CV's to be included in **Schedule 15** of the Returnable Documents. Failure to do so during tender phase will lead to disqualification of tenderer.

Construction managers must have successfully **completed** (please note that current projects will not be included in the evaluation) at least 5 projects of a similar scope and nature in the last 10 years to score full marks on this criterion. Refer to the table below for a measurement of how points will be awarded against this criterion.

Projects of a similar scope and nature is regarded as:

- Pump stations with a capacity of 100ℓ/s or greater
- Water/Wastewater Treatment Works with a capacity of 1Mℓ/d or greater

If, during construction, the contractor wishes to replace the construction manager, the contractor will apply in writing to the Engineer as per clause 6.8 of FIDIC. Only similarly experienced and competent construction managers will be considered.

2. CONSTRUCTION MANAGER	
INDICATOR	**Evaluation Criteria for Construction manager:** (number of similar projects completed by the Construction manager in the last 10 years)
0	The Construction manager has completed zero projects in the last 10 years
1	The Construction manager has completed only 1 project in the last 10 years
2	The Construction manager has completed exactly 2 projects in the last 10 years
3	The Construction manager has completed exactly 3 or more projects in the last 10 years
4	The Construction manager has completed exactly 4 or more projects in the last 10 years
5	The Construction manager has completed 5 or more projects in the last 10 years

The functionality proposal will be evaluated individually on score sheets, by a representative evaluation panel according to the evaluation criteria indicated above. All service providers who scored less than 70 out of 100 points for functionality will not be considered further. At least 3 evaluators will evaluate the quality schedules separately.

NB: Points scored for Quality (functionality) will not have an influence on the total tender evaluation points.

Where the entity tendering is a Joint Venture the tender must be accompanied by a statement describing exactly what aspects of the work will be undertaken by each party to the joint venture (appended to Schedule 3, Part T2.2: Returnable Schedules).

C.2.1.4.4.3 A copy of the authorisation letter must be submitted together with the bid document at the closing date and time of the bid.

C.2.1.4.5 Compulsory clarification meeting
Tenderers are required to attend a compulsory clarification meeting at which they may familiarise themselves with aspects of the proposed work, services or supply and pose questions.
Details of the meeting(s) are stated in the General Tender Information.
Only those tenders submitted by tenderers whose attendance at this meeting have been recorded, will be declared responsive.

C.2.1.4.6 Good standing with Bargaining Council
Only those tenders submitted by tenderers who are in good standing with the **Bargaining Council for the Civil Engineering Industry (BCCEI)** at the time of the tender award will be declared responsive. Tenderers must attach such proof to the schedule titled **Declaration in Respect of Compliance with Labour Legislation** or obtain such upon being requested to do so in writing and within the period contained in such a request, failing which their tenders will be declared non-responsive.

C.2.1.4.7 Good standing with SARS/Tax Clearance
Bidders are required to submit their unique personal identification number (pin) issued by SARS to enable the organ of state to view the taxpayer's profile and tax status. Application for the tax compliance status (TCS) certificate or pin may also be made via e-filing. In order to use this provision, taxpayers will need to register with SARS as e-filers through the website www.SARS.gov.za. Bidders may also submit a printed TCS certificate together with the bid (valid and original). In Bids where Consortia/Joint Venture/Sub-contractors are involved each party must submit a separate and Original Valid Tax Clearance Certificate.

C.2.3 Check documents

Delete the clause content and replace with the following:
The Tenderer should check the tender documents on receipt for completeness, missing or duplicated pages, indistinct figures or writing and any obvious errors. The Tenderer must notify the Employer's agent at once of any such problems identified

C.2.7 Clarification meeting

Add the following after the second sentence:
The arrangements for the site visit/clarification meeting are as stated on the General Tender Information page and in the Responsiveness Criteria (if applicable). Failure to provide proof of attendance of this clarification meeting will result in disqualification of the tender. The applicable schedule in the returnable documents must be signed by employer **or** employer's agent as proof of attendance or the signed (signed by attending tenderers) attendance register should be attached to this schedule.

Tenderers should be represented at the clarification meeting by a person who is suitably qualified and experienced to comprehend the implications of the work involved. The employer or employer's agent cannot be held liable for any information discussed during the Clarification Meeting not correctly carried forward to the authorised person signing the tender document.

C.2.8 Seek Clarification

Add the following after the first sentence:
The tenderer warrants that it has:

a) inspected the Specifications and read and fully understood the Conditions of Contract.
b) read and fully understood the whole text of the Specifications and Price Schedule and thoroughly acquainted itself with the nature of the goods proposed and generally of all matters which may influence the Contract.
c) visited the site(s) where delivery of the proposed works will take place, carefully examined existing conditions, the means of access to the site(s), the conditions under which the delivery is to be made, and acquainted itself with any limitations or restrictions that may be imposed by the Municipal or other Authorities in regard to access and transport of materials, plant and construction equipment to and from the site(s) and made the necessary provisions for any additional costs involved thereby.
d) requested the Employer to clarify the requirements contained in the Specifications and Price Schedule, the exact meaning or interpretation of which is not clearly intelligible to the tenderer.
e) received any notices to the tender documents which have been issued in accordance with the Employer's SCM Policy.

The Employer will therefore not be liable for the payment of any extra costs resulting from any claim submitted by the tenderer arising from any alleged ambiguity or uncertainty contained in the tender document.

C.2.11 Alterations to documents

Delete the first sentence and replace with the following:
Do not make any alterations or additions to the tender documents, except to comply with instructions issued by the employer in writing, or necessary to correct errors made by the tenderer.

C.2.12 Alternative tender offers

C.2.12.1 *Add the following to C.2.12.1 at the end of the first sentence:*
If a tenderer wishes to submit an alternative tender offer, he shall do so as a separate offer on a separate set of tender documents. The alternative tender offer shall be submitted in a separate sealed envelope on a separate Form of Offer, both clearly marked "Alternative Tender" in order to distinguish it from the main tender offer.

While it is not necessary to duplicate all parts of the main tender offer, the alternative tender offer shall be supported by the following documents as applicable:

a) the schedule that compares the alternative(s) offered with the requirements of the issued tender documents
b) preliminary designs, calculations, drawings and all other pertinent technical information and characteristics must be submitted with the alternative tender offer, in order to enable the Employer to evaluate the efficacy of the alternatives proposed
c) revised Bills of Quantities, or parts thereof, highlighting the changes made, together with a revised Summary, the total of which has been carried to the Form of Offer
d) details of any proposed amendments to the Pricing Assumptions

An alternative of the highest ranked acceptable main tender offer that is priced higher than the main tender offer may be recommended for award, provided that the ranking of the alternative tender -offer is higher than the ranking of the next ranked acceptable main tender offer.

The Employer's costs in confirming the acceptability of the alternative offer will be, *inter alia*, considered in considering the alternative offer.

The Employer will not be bound to consider alternative tenders and shall have sole discretion in this regard.

If the alternative is accepted, the Contractor shall accept full responsibility that the alternative offer complies in all respects with the Employer's standards and requirements.

C.2.13 Submitting a tender offer

Add the following *to C.2.13.1 at the end of the first sentence:*

C.2.13.1 Where the tendering entity is a joint venture it is recommended that the standard CIDB Joint Venture Agreement be used.

Delete the following word from C.2.13.2 and add the following sentence after the first sentence:

C.2.13.2 Delete "either electronically (if they were issued in electronic format) or". No electronic submissions will not be accepted unless specifically requested by the Employer in writing.

Add the following to C.2.13.3:

C.2.13.3 Parts of each tender offer communicated on paper shall be submitted as an original, plus 0 (nil) copies.

Add *the following after the first sentence of C.2.13.4:*

C.2.13.4 The tender shall be signed by a person duly authorised to do so. Tenders submitted by joint ventures of two or more firms shall be accompanied by the document of formation of the joint venture, authenticated by a notary public or other official deputed to witness sworn statements, in which is defined precisely the conditions under which the joint venture will function, its period of duration, the persons authorised to represent and obligate it, the participation of the several firms forming the joint venture, and any other information necessary to permit a full appraisal of its functioning.

Delete the clause *and replace with the following.*

C.2.13.5 The tender submission details are all described on the General Tender Information page.

The Employer's address for delivery of tender offers and identification details to be shown on each tender offer package are:

Location of tender box:	Langeberg Municipal Office
Physical address:	Langeberg Municipality, Main Street 28, Ashton
Identification details:	Tender number: 13/2026
Title of tender:	UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1

Sealed tenders with the name and address of the tenderer, the tender No. and title and the closing date indicated on the envelope, must be placed in the appropriate official tender box at the abovementioned address.

Add the following to C.2.13.6:

C.2.13.6 A two-envelope procedure will **not** be followed (C.3.5).

Add the following new Clauses after C.2.13.9 and before C.2.14:

C.2.13.10 By signing the offer part of C1.1 Form of Offer and Acceptance the tenderer declares that all information provided in the tender submission is true and correct.

C.2.13.11 The Employer shall not formally issue tender documents in electronic format and shall only issue tender documents in hardcopy. An electronic version of the issued tender documents, or elements thereof, may be made available to the tenderer at the Employer's discretion, upon written request in terms of this clause, subject to the following:

a) No Electronic copies of the issued tender documents including BOQ, or parts thereof, will be provided to tenderers.
b) The Employer shall not accept tenders submitted in electronic format. Only those tenders that have been completed on the issued hard copy tender document shall be considered.
c) Where Addenda have been issued which amend the Bills of Quantities, then the printed Bills of Quantities shall take these into account. The pages of the issued Bills of Quantities should not be removed from the tender document.
d) The Employer accepts no responsibility or liability arising from any reliance on or use of the electronic version provided in terms of this clause. Tenderers are alerted to the fact that electronic versions of the tender documents may not reflect any notices or addenda that amend the tender document.
e) Any non-compliance with these provisions, including effecting any unauthorised alterations to the tender documents as contemplated in C.2.11, shall render the tender non-responsive. The Employer reserves the right to take any action against such tenderer allowed in law including, in circumstances where the tender had already been awarded, the right to cancel the contract.

C.2.15 Closing time

Add the following to C.2.15.1 after the first sentence:

C.2.15.1 The closing time for submission of tender offers is as stated in the Tender Notice and Invitation to Tender.

C.2.16 Tender offer validity

Add the following to C.2.16.1 after the first sentence:

C.2.16.1 The tender offer validity period is **120 days**.

C.2.16.2 Delete the clause and replace with the following:
Notwithstanding the period stated above, bids shall remain valid for acceptance for a period of twelve (12) months after the expiry of the original validity period, unless the Municipality is notified in writing of anything to the contrary by the bidder. The validity of bids may be further extended by a period of not more than six months subject to mutual agreement and administrative processes and upon approval by the Municipal Manager.

C.2.17 Clarification of tender offer after submission

Add the following to C.2.17 at the end of the third sentence:

A tender will be rejected as non-responsive if the tenderer fails to provide any clarification or supporting documents requested by the Employer within the time for submission stated in the Employer's written request for such clarification or documents.

C.2.18 Provide other material

Delete the following word in C.2.18.1:

C.2.18.1 "notarized"

Add the following to C.2.18.1 at the end of the first paragraph:

Provide, on written request by the Employer, where the transaction value (tendered amount) inclusive of VAT **exceeds R 10 million**:

a) audited annual financial statement for the past 3 years, or for the period since establishment if established during the past 3 years, if required by law to prepare annual financial statements for auditing;
b) a *certificate* signed by the tenderer certifying that the tenderer has no undisputed commitments for municipal services towards a municipality or other service provider in respect of which payment is overdue for more than 30 days;
c) particulars of any contracts awarded to the tenderer by an organ of state during the past five years, including particulars of any material non-compliance or dispute concerning the execution of such contract;
d) a statement indicating whether any portion of the goods or services are expected to be sourced from outside the *Republic*, and, if so, what portion and whether any portion of payment from the municipality or municipal entity is expected to be transferred out of the Republic.

Each party to a Consortium/Joint Venture shall submit separate certificates/statements in the above regard.

Add the following Clauses after C.2.18.2 and before Clause C.2.19:

C.2.18.3 Tenderers shall fully cooperate with the Employer's external service provider appointed to perform a due diligence review and risk assessment upon receipt of such written instruction from the Employer.

Failure to fully cooperate could result in a tender being declared as non-responsive.

C.2.18.4 Compliance with Occupational Health and Safety Act, 85 of 1993
Tenderers are to note the requirements of the Occupational Health and Safety Act, 85 of 1993 and the Construction Regulations, 2014 issued in terms of Section 43 of the Act. The Tenderer shall be deemed to have read and fully understood the requirements of the above Act and Regulations and to have allowed for all costs in compliance therewith.

In this regard the Tenderer shall submit with his tender or upon request, appended to Schedule 21: Health and Safety Plan in T2.2: Returnable Schedules, a draft Health and Safety Plan in respect of the Works in sufficient detail to demonstrate the necessary competencies and resources to perform the construction work all in accordance with the Act, Regulations and Health and Safety Specification in Part C6 in the Scope of Work.

Such Health and Safety Plan shall cover inter-alia the following details:

(1) Management Structure, Site Supervision and Responsible Persons including a succession plan.
(2) Contractor's induction training programme for employees, sub-contractors, and visitors to the Site.
(3) Health and safety precautions and procedures to be adhered to, to ensure compliance with the Act, Regulations and Safety Specifications.
(4) Regular monitoring procedures to be performed.
(5) Regular liaison, consultation, and review meetings with all parties.
(6) Site security, welfare facilities and first aid.
(7) Site rules and fire and emergency procedures.

Tenderers are to note that the Contractor is required to ensure that all sub-contractors or others engaged in the performance of the contract also comply with the above requirements.

The Contractor shall prepare and maintain a Health and Safety File in respect of the project, which shall always be available for inspection on Site and handed over to the Employer on Final Completion of the project.

The Contractor is required to submit to the Employer the Occupational Health and Safety Agreement (included in C1.5 of the Contract Document) and a letter of good standing from the Compensation Commissioner, or a licensed compensation insurer, within 14 days after the Commencement Date of the Contract.

C.2.23 Certificates

Add the following after the first sentence:
The tenderer is required to submit the following:

C.2.23.1 Evidence of tax compliance

Tenderers shall be registered with the South African Revenue Service (SARS) and their tax affairs must be in order and they must be tax compliant subject to the requirements of clause C.2.1.4.2.h. In this regard, it is the responsibility of the Tenderer to submit evidence in the form of a valid Tax Clearance Certificate issued by SARS to the Employer at the Supplier Management Unit located within the Supplier Management / Registration Office 28 Main Street, Ashton. (Tel 023 656 8200) or included with this tender. The tenderer must also provide its Tax Compliance Status PIN number on the **Compulsory Enterprise Questionnaire**

Each party to a Consortium/Joint Venture shall submit a separate Tax Clearance Certificate.

Before making an award the Langeberg Municipality must verify the bidder's tax compliance status. Where the recommended bidder is not tax compliant, the bidder should be notified of the non-compliant status and be requested to submit to the Langeberg Municipality, within 7 working days, written proof from SARS that they have made arrangement to meet their outstanding tax obligations. The proof of tax compliance submitted by the bidder must be verified by the Langeberg Municipality via CSD or e-Filing. The Langeberg Municipality should reject a bid submitted by the bidder if such bidder fails to provide proof of tax compliance within the timeframe stated herein.

Only foreign suppliers who have answered "NO" to all the questions contained in the Questionnaire to Bidding Foreign Suppliers section on the **Details of Tenderer** pages of the tender submission, are not required to register for a tax compliance status with SARS.

C.2.23.2 Broad-Based Black Economic Empowerment Status Level Documentation

In order to qualify for preference points, it is the responsibility of the tenderer to submit documentary proof, either as certificates, sworn affidavits or any other requirement prescribed in terms of the B-BBEE Act, of its B-BBEE status level of contribution in accordance with the applicable Codes of good practise as issued by the Department of Trade and Industry, to the LANGEBERG MUNICIPALITY at the Supplier Management Unit located within the Supplier Management / Registration Office, 28 Main Street, Ashton.(Tel: 023 626 8200) or included with the tender submission.

Consortiums/Joint Ventures will qualify for preference points, provided that the **entity** submits the relevant certificate/scorecard in accordance with the applicable codes of good practise. Note that, in the case of unincorporated entities, a verified consolidated B-BBEE scorecard must be submitted in the form of a certificate with the tender.

Tenderers are further referred to the content of the **Preference Schedule** for the full terms and conditions applicable to the awarding of preference points.

The applicable code for this tender is the **Amended Codes for Measuring Broad-Based Black Economic Empowerment.**

The tenderer shall indicate in Section 25 of the **Preference Schedule** the Level of Contribution in respect of the enterprise status or structure of the tendering entity (the supplier).

Add the follow new clause after C.2.23.2

C.2.24 Proposed Deviations and Qualifications

Where the tenderer cannot tender in all respects in accordance with the provisions contained in the tender documents, all deviations therefrom shall be clearly and separately listed in the schedule titled **Proposed Deviations and Qualifications by Tenderer** in T2.2 Returnable Schedules, or in a tenderer's covering letter expressly referenced in this schedule.

The tenderer accept that the Employer will examine such deviations in terms of clause C.3.8.2 and shall not be bound to accept any such deviations or qualifications.

It must be clearly stated by the tenderer whether the sum tendered in the Tender Offer includes for all such deviations or qualifications listed or referred to in the schedule titled **Proposed Deviations and Qualifications by Tenderer** or not.

C.3 The Employer's undertakings

C.3.2 Issue Addenda

Delete the first sentence and replace with:

If necessary, issue addenda in writing that may amend or amplify the tender documents to each tenderer during the period from the date the tender documents are available until one week before the tender closing time stated in the Tender Data. The Employer reserves its rights to issue addenda less than one week before the tender closing time in exceptional circumstances.

Add the following to C.3.2 at the end of the paragraph:

Notwithstanding any requests for confirmation of receipt of` Addenda issued, the tenderer shall be deemed to have received such addenda if the employer can show proof of transmission thereof (or a notice in respect thereof) via electronic mail, facsimile, or registered post. It is therefore of great importance that the contact details provided during the compulsory clarification meeting is legible and contactable.

C3.4 Opening of tender submissions

Add the following to C.3.4.2 at the end of the paragraph:

The location for opening of the tender offers is the Tender Submission Office at the address as stated on the General Tender Information page.

C.3.8 Test for responsiveness

C.3.8.2 *Replace the final sentence of C.3.8.2 with the following:*

Reject a non-responsive tender offer, and not allow it to be subsequently made responsive by correction or withdrawal of the material deviation.

Add the following after clause C.3.8.2

C.3.8.3 The Employer reserves the right to accept a tender offer which does not, in the Employer's opinion, materially and/or substantially deviate from the terms, conditions, and specifications of the tender documents.

C.3.9 Arithmetical errors, omissions, and discrepancies

Add the following after clause C.3.9.4

C.3.9.5 In the event of tendered rates or lump sums being declared by the Employer to be unacceptable to it because they are not priced, either excessively low or high, or not in proper balance with other rates or lump sums, the Tenderer may be required to produce evidence and advance arguments in support of the tendered rates or lump sums objected to. If, after submission of such evidence and any further evidence requested, the Employer is still not satisfied with the tendered rates or lump sums objected to, it may request the tenderer to amend these rates and lump sums along the lines indicated by it.

The Tenderer will then *have* the option to alter and/or amend the rates and lump sums objected to and such other related amounts as are agreed on by the Employer, but this shall be done without altering the tender offer in accordance with this clause.

Should the Tenderer fail to amend his tender in a manner acceptable to and within the time stated by the Employer, the Employer may declare the tender as non-responsive.

C.3.10 Clarification of a tender offer

Delete the clause and replace with the following:

C3.10 The Employer may, after the closing date, request additional information or clarification from any tenderer, in writing on any matter affecting the evaluation of the tender offer or that could give rise to ambiguity in a contract arising from the tender offer, which written request and related response shall not change or affect their competitive position or the substance of the tenderer's offer.

C.3.11 Evaluation of tender offers

Add the following Clauses after clause C.3.11.1 and before Clause C.3.12

C.3.11.2 Where the scoring of functionality forms part of a bid process, each member of the Bid Evaluation Committee must individually score functionality. The individual scores must then be interrogated and calibrated if required where there are significant discrepancies. The individual scores must then be added together and averaged to determine the final score.

C.3.11.3 The tender will be evaluated in terms of the requirements of the Preferential Procurement Regulations of 2022 as follows:

C.3.11.3.1 The preference point system applicable to this tender is the 80/20 preference point system.

C.3.11.3.2 Price and specific goals will be scored, as relevant, to two decimal places.

C.3.11.3.3 Confirm that tenderers are eligible for the preferences claimed in accordance with the provisions of the tender data and reject all claims for preferences where tenderers are not eligible for such preferences.

Points will be awarded to tenderers who are eligible for preferences in terms of the **Preference Schedule** (where preferences are granted in respect of B-BBEE contribution) which is included in T2.2 Returnable Schedules.

The terms and conditions of the **Preference Schedule** shall apply in all respects to the tender evaluation process and any subsequent contract.

In addition, the various deemed B-BBEE Status Level of Contributor in accordance with the relevant Codes can be attained and such tenderers must be awarded the appropriate number of points.

It should be noted that such Deemed B-BBEE Status Level of Contribution can be enhanced or discounted in accordance with the relevant clauses in the applicable Codes.

C.3.11.4 Risk Analysis

Notwithstanding compliance with regard to CIDB registration or any other requirements of the tender, the employer will perform a risk analysis in respect of the following:

a) reasonableness of the financial offer
b) reasonableness of unit rates and prices
c) the tenderer's ability to fulfil its obligations in terms of the tender document, that is, that the tenderer can demonstrate that he/she/it possesses the necessary professional and technical qualifications, professional and technical competence, financial resources (Bank Ratings will be requested), equipment and other physical facilities, managerial capability, reliability, capacity, experience, reputation, personnel to perform the contract, etc.; the Employer reserves the right to consider a tenderer's existing contracts with the Employer in this regard
d) any other matter relating to the submitted bid, the tendering entity, matters of compliance, verification of submitted information and documents.

The conclusions drawn from this risk analysis will be used by the Employer in determining the acceptability of the tender offer in terms of C.3.13.

C.3.13 Acceptance of tender offer

Delete first sentence of C.3.13 and replace with the following):

Accept the tender offer, if in the opinion of the employer, it does not present any material risk and only if the tenderer:

Delete C.3.13 a) and replace with the following):

a) is not under restrictions, has any principals who are under restrictions, or is not currently a supplier to whom notice has been served for abuse of the supply chain management system, preventing participation in the employer's procurement;

Add the following below C.3.13 f)

If an award cannot be made in terms of anything contained herein, the Employer reserves the right to consider the next ranked tenderer(s). The Employer does not bind himself to accept the lowest priced tender, highest evaluation points tender or any tender offer. The Employer has the right to accept any part of a tender as he may deem expedient subject to negotiation with the successful tenderer for the whole tender.

C.3.13.1 The Employer reserves the right not to make an award, or revoke an award already made, where the implementation of the contract may result in reputational risk or harm to the Langeberg Municipality as a result of (inter alia):

a) reports of poor governance and/or unethical behaviour;
b) association with known family of notorious individuals;
c) poor performance issues, known to the Langeberg Municipality;
d) negative social media reports; and
e) adverse assurance (e.g. due diligence) report outcomes.

C.3.13.2 The Employer reserves the right to nominate an alternative bidder at the time when an award is made and in the event that a contract is terminated during the execution thereof, the LANGEBERG MUNICIPALITY may consider the award of the contract, or non-award, to the alternative bidder in terms of the procedures included its SCM Policy.

C.3.13.3 The Employer shall notify the successful tenderer in writing of the decision of the Employer's Bid Adjudication Committee to award the tender to the successful tenderer. No rights shall accrue to the successful tenderer in terms of this notice.

C.3.13.4 The Employer shall, at the same time as notifying the successful tenderer of the Bid Adjudication Committee's decision to award the tender to the successful tenderer, also give written notice to the other tenderers informing them that they have been unsuccessful.

C.3.17 Provide copies of the contract

Add the following after the first sentence:

The number of paper copies of the signed contract to be provided by the Employer is one.

Add the following Clauses after C.3.18:

C.3.19 Negotiations with preferred tenderers

The Employer may *negotiate* the final terms of a contract with tenderers identified through a competitive tendering process as preferred tenderers provided that such negotiation:

a) does not allow any preferred tenderer a second or unfair opportunity;
b) is not to the detriment of any other tenderer; and
c) does not lead to a higher price than the tender as submitted.

If negotiations fail to result in acceptable contract terms, the Municipal Manager (or his delegated authority) may terminate the negotiations and cancel the tender or invite the next ranked tenderer for negotiations. The original preferred tenderer should be informed of the reasons for termination of the negotiations. If the decision is to invite the next highest ranked tenderer for negotiations, the failed earlier negotiations may not be reopened by the LANGEBERG MUNICIPALITY.

Minutes of any such negotiations shall be kept for record purposes.

The provisions of this clause will be equally applicable to any invitation to negotiate with any other tenderers.

In terms of the PPPFA Regulations, 2017, tenders must be cancelled in the event that negotiations fail to achieve a market related price with any of the three highest scoring tenderers.

C.3.20 Claims arising after submission of tender

No claim for any extras arising out of any doubt or obscurity as to the true intent and meaning of anything shown on the Contract Drawings or contained in the Conditions of Contract, Scope of Work and Pricing Data,

will be admitted by the Employer/Employer's Agent after the submission of any tender and the Tenderer shall be deemed to have:

a) inspected the Contract Drawings and read and fully understood the Conditions of Contract.
b) read and fully understood the whole text of the Scope of Work and Pricing Data and thoroughly acquainted himself with the nature of the works proposed and generally of all matters which may influence the Contract.
c) visited the site of the proposed works, carefully examined existing conditions, the means of access to the site, the conditions under which the work is to be done and acquainted himself with any limitations or restrictions that may be imposed by the Municipal or other Authorities in regard to access and transport of materials, plant and construction equipment to and from the site and made the necessary provisions for any additional costs involved thereby.
d) requested the Employer or his duly authorised agent to make clear the actual requirements of anything shown on the Contract Drawings or anything contained in the Scope of Work and Pricing Data, the exact meaning or interpretation of which is not clearly intelligible to the Tenderer.
   Before submission of any tender, the Tenderer should check the number of pages, and if any are found to be missing or duplicated, or the figures or writing indistinct, or if the Pricing Data contain any obvious errors, the tenderer must apply to the Employer/Employer's Agent at once to have the same rectified, as no liability will be admitted by the Employer/Employer's Agent in respect of errors in any tender due to the foregoing.
e) received any Addenda to the tender documents which have been issued in accordance with the Employer's Supply Chain Management Policy.

C.3.21 General supply chain management conditions applicable to tenders

In terms of its *Supply* Chain Management Policy the Employer may not consider a tender unless the provider who submitted the tender:

a) has furnished the Employer with that provider's:
   - full name;
   - identification number or company or other registration number; and
   - tax reference number and VAT registration number, if any;

b) has indicated whether:
   - the provider is in the service of the state, or has been in the service of the state in the previous twelve months;
   - the provider is not a natural person, whether any of the directors, managers, principal shareholders or stakeholders is in the service of the state, or has been in the service of the state in the previous twelve months;
   - whether a spouse, child or parent of the provider or of a director, manager, shareholder or stakeholder referred to above is in the service of the state, or has been in the service of the state in the previous twelve months; or

c) irrespective of the procurement process followed, the Employer is prohibited from making an award to:
   - a person who is in the service of the state;
   - a juristic entity of which any director, manager, principal shareholder or stakeholder is in the service of the state;
   - an advisor or consultant contracted with the Employer, or
   - a person, advisor or corporate entity involved with the bid specification committee, or a director of such corporate entity.

The Contract Price shall not be subject to any contract price adjustment, the rates and prices tendered in the bills of quantities shall. In this regard, tenderers shall complete Schedule 1, Part T2.2: Returnable Schedules: Compulsory Enterprise Questionnaire. Failure to complete this Schedule may result in the tender not being considered.

C.3.22 Combating abuse of the Supply Chain Management Policy

In terms of the *Municipality's* Supply Chain Management Policy, the Employer may reject the tender of any tenderer if that tenderer or any of its directors has:

a) failed to pay municipal rates and taxes or municipal service charges and such rates, taxes and charges are in arrears for more than three months
b) failed, during the last five years, to perform satisfactorily on a previous contract with the Municipality or any other organ of state after written notice was given to that tenderer that performance was unsatisfactory.
c) abused the supply chain management system of the Employer or has committed any improper conduct in relation to this system.
d) been convicted of fraud or corruption during the past five years.

e) wilfully neglected, reneged on, or failed to comply with any government, municipal or other public sector contract during the past five years; or
f) been listed with the Register of Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004) or has been listed on National Treasury's database as a person or juristic entity prohibited from doing business with the public sector.

In this regard, tenderers *shall* complete Part T2.2: Returnable Schedules: Declaration of Tenderer's Past Supply Chain Management Practices (in terms of the Municipal Finance Management Act). Failure to complete this Schedule may result in the tender not being considered.

C.3.23 UIF payments

The Tenderer shall submit to the Employer a letter from the Industrial Council indicating his good standing with regard to UIF payments upon being requested to do so.

C.3.24 Price variations

Tender document or part *thereof*. Only those tenders that have been completed on the issued hard copy tender final and binding throughout the period of the contract. However, price adjustments for variations in the costs of special materials may be applicable where the Employer/Employer's Agent specifies such materials and the relevant information in the Contract Data.

Notwithstanding the above, if, as a result of any extension of time granted, the duration of the contract period exceeds one year, the contract will automatically be subject to contract price adjustment for that period by which the extended contract period exceeds such one year.

Adjustment in rates or prices shall be subject to the provisions of Part C1.2: Contract Data.

C.3.25 Requests for contract documents, or parts thereof, in electronic format

The Employer shall *not* formally issue tender documents in electronic format as contemplated in C.2.13.2 and C.2.13.3 and shall only issue tender documents in hardcopy. An electronic version of the issued tender documents may be made available to the tenderer, upon written request in terms of this clause, subject to the following:

a) Electronic copies of the contract document, or parts thereof, will only be provided to tenderers who have been issued with the tender documents as contemplated in C.1.2 in hardcopy.
b) The electronic version shall not be regarded as a substitute for the issued tender documents.
c) The Employer shall not accept tenders submitted in electronic format. Tenderers may **not** complete and submit a printed copy of the electronic version of the tender document.
d) The Employer accepts no responsibility or liability arising from any reliance on or use of the electronic version provided in terms of this clause. The Employer further does not guarantee that the electronic version corresponds with the issued tender documents in all respects. Tenderers are alerted to the fact that electronic versions of the tender documents may not reflect any notices or addenda that amend the tender document.
e) Any non-compliance with these provisions, including effecting any unauthorised alterations to the tender document as contemplated in C.2.11, shall render the tender invalid. The Employer reserves the right to take any action against such tenderer allowed in law including, in circumstances where the tender had already been awarded, the right to cancel the contract.
f) In requesting the electronic version of the tender document or parts thereof, the tenderer is deemed to have read, understood, and accepted all of the above conditions.

C.3.26 Bidders who do not submit B-BBEE Status Level Verification Certificates or are non-compliant contributors to B-BBEE do not qualify for preference points for B-BBEE but should not be disqualified from the bidding process. They will score points out 80 for price only and zero (0) points out of 20 for B-BBEE. A trust, consortium or joint venture must submit a consolidated B-BBEE Status Level Verification Certificate for every separate bid

Annex C
(normative)
Standard Conditions of Tender

C.1 General

C.1.1 Actions

C.1.1.1 The employer and each tenderer submitting a tender offer shall comply with these conditions of tender. In their dealings with each other, they shall discharge their duties and obligations as set out in C.2 and C.3, timeously and with integrity, and behave equitably, honestly and transparently, comply with all legal obligations and not engage in anticompetitive practices.

C.1.1.2 The employer and the tenderer and all their agents and employees involved in the tender process shall avoid conflicts of interest and where a conflict of interest is perceived or known, declare any such conflict of interest, indicating the nature of such conflict. Tenderers shall declare any potential conflict of interest in their tender submissions. Employees, agents and advisors of the employer shall declare any conflict of interest to whoever is responsible for overseeing the procurement process at the start of any deliberations relating to the procurement process or as soon as they become aware of such conflict and abstain from any decisions where such conflict exists or recuse themselves from the procurement process, as appropriate.

Note:
1) A conflict of interest may arise due to a conflict of roles which might provide an incentive for improper acts in some circumstances. A conflict of interest can create an appearance of impropriety that can undermine confidence in the ability of that person to act properly in his or her position even if no improper acts result.
2) Conflicts of interest in respect of those engaged in the procurement process include direct, indirect or family interests in the tender or outcome of the procurement process and any personal bias, inclination, obligation, allegiance or loyalty which would in any way affect any decisions taken.

C.1.1.3 The employer shall not seek and a tenderer shall not submit a tender without having a firm intention and the capacity to proceed with the contract.

C.1.2 Tender Documents issued by the employer for the purpose of a tender offer are listed in the tender data.

C.1.3 Interpretation

C.1.3.1 The tender data and additional requirements contained in the tender schedules that are included in the returnable documents are deemed to be part of these conditions of tender.

C.1.3.2 These conditions of tender, the tender data and tender schedules which are required for tender evaluation purposes, shall form part of any contract arising from the invitation to tender.

C.1.3.3 For the purposes of these conditions of tender, the following definitions apply:

a) conflict of interest means any situation in which:
i) someone in a position of trust has competing professional or personal interests which make it difficult to fulfil his or her duties impartially;
ii) an individual or tenderer is in a position to exploit a professional or official capacity in some way for their personal or corporate benefit; or
iii) incompatibility or contradictory interests exist between an employee and the tenderer who employs that employee.
b) comparative offer means the price after the factors of a non-firm price and all unconditional discounts it can be utilised to have been taken into consideration;
c) corrupt practice means the offering, giving, receiving or soliciting of anything of value to influence the action of the employer or his staff or agents in the tender process;
d) fraudulent practice means the misrepresentation of the facts in order to influence the tender process or the award of a contract arising from a tender offer to the detriment of the employer, including collusive practices intended to establish prices at artificial levels;

C.1.4 Communication and employer's agent
Each communication between the employer and a tenderer shall be to or from the employer's agent only, and in a form that can be readily read, copied and recorded. Communications shall be in the English language. The employer shall not take any responsibility for non-receipt of communications from or by a tenderer. The name and contact details of the employer's agent are stated in the tender data.

C.1.5 Cancellation and Re-Invitation of Tenders

C.1.5.1 An employer may, prior to the award of the tender, cancel a tender if-

a) due to changed circumstances, there is no longer a need for the engineering and construction works specified in the invitation;
b) funds are no longer available to cover the total envisaged expenditure; or
c) no acceptable tenders are received.
d) there is a material irregularity in the tender process.

C.1.5.2 The decision to cancel a tender invitation must be published in the same manner in which the original tender invitation was advertised

C.1.5.3 An employer may only with the prior approval of the relevant treasury cancel a tender invitation for the second time.

C.1.6 Procurement procedures

C.1.6.1 General

Unless otherwise *stated* in the tender data, a contract will, subject to C.3.13, be concluded with the tenderer who in terms of C.3.11 is the highest ranked or the tenderer scoring the highest number of tender evaluation points, as relevant, based on the tender submissions that are received at the closing time for tenders.

C.1.6.2 Competitive negotiation procedure

C.1.6.2.1 Where the tender data require that the competitive negotiation procedure is to be followed, tenderers shall submit tender offers in response to the proposed contract in the first round of submissions. Notwithstanding the requirements of C.3.4, the employer shall announce only the names of the tenderers who make a submission. The requirements of C.8 relating to the material deviations or qualifications which affect the competitive position of tenderers shall not apply.

C.1.6.2.2 All responsive tenderers or at least a minimum of not less than three responsive tenderers that are highest ranked in terms of the evaluation criteria stated in the tender data shall be invited to enter into competitive negotiations based on the principle of equal treatment, keeping confidential the proposed solutions and associated information.

Notwithstanding the *provisions* of C.2.17, the employer may request that tenders be clarified, specified and fine-tuned in order to improve a tenderer's competitive position provided that such clarification, specification, fine-tuning or additional information does not alter any fundamental aspects of the offers or impose substantial new requirements which restrict or distort competition or have a discriminatory effect.

C.1.6.2.3 At the conclusion of each round of negotiations, tenderers shall be invited by the employer to revise their tender offer based on the same evaluation criteria, with or without adjusted weightings. Tenderers shall be advised when they are to submit their best and final offer.

C.1.6.2.4 The contract shall be awarded in accordance with the provisions of C.3.11 and C.3.13 after tenderers have been requested to submit their best and final offer.

C.1.6.3 Proposal procedure using the two stage-system

C.1.6.3.1 Option 1

Tenderers shall in the first *stage* submit technical proposals and, if required, cost parameters around which a contract may be negotiated. The employer shall evaluate each responsive submission in terms of the method of evaluation stated in the tender data, and in the second stage negotiate a contract with the tenderer scoring the highest number of evaluation points and award the contract in terms of these conditions of tender.

C.1.6.3.2 Option 2

C.1.6.3.2.1 Tenderers shall submit in the first stage only technical proposals. The employer shall invite all responsive tenderers to submit tender offers in the second stage, following the issuing of procurement documents.

C.1.6.3.2.2 The employer shall evaluate tenders received during the second stage in terms of the method of evaluation stated in the tender data and award the contract in terms of these conditions of tender.

C.2 Tenderer's obligations

C.2.1 Eligibility

C.2.1.1 Submit a tender offer only if the tenderer satisfies the criteria stated in the tender data and the tenderer, or any of his principals, is not under any restriction to do business with employer.

C.2.1.2 Notify the employer of any proposed material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used by the employer as the basis in a prior process to invite the tenderer to submit a tender offer and obtain the employer's written approval to do so prior to the closing time for tenders.

C.2.2 Cost of tendering

C.2.2.1 Accept that, unless otherwise stated in the tender data, the employer will not compensate the tenderer for any costs incurred in the preparation and submission of a tender offer, including the costs of any testing necessary to demonstrate that aspects of the offer complies with requirements.

C.2.2.2 The cost of the tender documents charged by the employer shall be limited to the actual cost incurred by the employer for printing the documents. Employers must attempt to make available the tender documents on its website so as not to incur any costs pertaining to the printing of the tender documents.

C.2.3 Check documents
Check the tender documents on receipt for completeness and notify the employer of any discrepancy or omission.

C.2.4 Confidentiality and copyright of documents
Treat as confidential all matters arising in connection with the tender. Use and copy the documents issued by the employer only for the purpose of preparing and submitting a tender offer in response to the invitation.

C.2.5 Reference documents
Obtain, as necessary for submitting a tender offer, copies of the latest versions of standards, specifications, conditions of contract and other publications, which are not attached but which are incorporated into the tender documents by reference.

C.2.6 Acknowledge addenda
Acknowledge receipt of addenda to the tender documents, which the employer may issue, and if necessary, apply for an extension to the closing time stated in the tender data, in order to take the addenda into account.

C.2.7 Clarification meeting
Attend, where required, a clarification meeting at which tenderers may familiarize themselves with aspects of the proposed work, services or supply and raise questions. Details of the meeting(s) are stated in the tender data.

C.2.8 Seek clarification
Request clarification of the tender documents, if necessary, by notifying the employer at least five (5) working days before the closing time stated in the tender data.

C.2.9 Insurance
Be aware that the extent of insurance to be provided by the employer (if any) might not be for the full cover required in terms of the conditions of contract identified in the contract data. The tenderer is advised to seek qualified advice regarding insurance.

C.2.10 Pricing the tender offer

C.2.10.1 Include in the rates, prices, and the tendered total of the prices (if any) all duties, taxes except Value Added Tax (VAT), and other levies payable by the successful tenderer, such duties, taxes and levies being those applicable fourteen (14) days before the closing time stated in the tender data.

C.2.10.2 Show VAT payable by the employer separately as an addition to the tendered total of the prices.

C.2.10.3 Provide rates and prices that are fixed for the duration of the contract and not subject to adjustment except as provided for in the conditions of contract identified in the contract data.

C.2.10.4 State the rates and prices in Rand unless instructed otherwise in the tender data. The conditions of contract identified in the contract data may provide for part payment in other currencies.

C.2.11 Alterations to documents
Do not make any alterations or additions to the tender documents, except to comply with instructions issued by the employer, or necessary to correct errors made by the tenderer. All signatories to the tender offer shall initial all such alterations.

C.2.12 Alternative tender offers

C.2.12.1 Unless otherwise stated in the tender data, submit alternative tender offers only if a main tender offer, strictly in accordance with all the requirements of the tender documents, is also submitted as well as a schedule that compares the requirements of the tender documents with the alternative requirements that are proposed.

C.2.12.2 Accept that an alternative tender offer must be based only on the criteria stated in the tender data or criteria otherwise acceptable to the employer.

C.2.12.3 An alternative tender offer must only be considered if the main tender offer is the winning tender.

C.2.13 Submitting a tender offer

C.2.13.1 Submit one tender offer only, either as a single tendering entity or as a member in a joint venture to provide the whole of the works identified in the contract data and described in the scope of works, unless stated otherwise in the tender data.

C.2.13.2 Return all returnable documents to the employer after completing them in their entirety, either electronically (if they were issued in electronic format) or by writing legibly in non-erasable ink.

C.2.13.3 Submit the parts of the tender offer communicated on paper as an original plus the number of copies stated in the tender data, with an English translation of any documentation in a language other than English, and the parts communicated electronically in the same format as they were issued by the employer.

C.2.13.4 Sign the original and all copies of the tender offer where required in terms of the tender data. The employer will hold all authorized signatories liable on behalf of the tenderer. Signatories for tenderers proposing to contract as joint ventures shall state which of the signatories is the lead partner whom the employer shall hold liable for the purpose of the tender offer.

C.2.13.5 Seal the original and each copy of the tender offer as separate packages marking the packages as "ORIGINAL" and "COPY". Each package shall state on the outside the employer's address and identification details stated in the tender data, as well as the tenderer's name and contact address.

C.2.13.6 Where a two-envelope system is required in terms of the tender data, place and seal the returnable documents listed in the tender data in an envelope marked “financial proposal” and place the remaining returnable documents in an envelope marked “technical proposal”. Each envelope shall state on the outside the employer’s address and identification details stated in the tender data, as well as the tenderer's name and contact address.

C.2.13.7 Seal the original tender offer and copy packages together in an outer package that states on the outside only the employer's address and identification details as stated in the tender data.

C.2.13.8 Accept that the employer will not assume any responsibility for the misplacement or premature opening of the tender offer if the outer package is not sealed and marked as stated.

C.2.13.9 Accept that tender offers submitted by facsimile or e-mail will be rejected by the employer, unless stated otherwise in the tender data.

C.2.14 Information and data to be completed in all respects
Accept that tender offers, which do not provide all the data or information requested completely and, in the form, required, may be regarded by the employer as non-responsive.

C.2.15 Closing time

C.2.15.1 Ensure that the employer receives the tender offer at the address specified in the tender data not later than the closing time stated in the tender data. Accept that proof of posting shall not be accepted as proof of delivery.

C.2.15.2 Accept that, if the employer extends the closing time stated in the tender data for any reason, the requirements of these conditions of tender apply equally to the extended deadline.

C.2.16 Tender offer validity

C.2.16.1 Hold the tender offer(s) valid for acceptance by the employer at any time during the validity period stated in the tender data after the closing time stated in the tender data.

C.2.16.2 If requested by the employer, consider extending the validity period stated in the tender data for an agreed additional period with or without any conditions attached to such extension.

C.2.16.3 Accept that a tender submission that has been submitted to the employer may only be withdrawn or substituted by giving the employer's agent written notice before the closing time for tenders that a tender is to be withdrawn or substituted. If the validity period stated in C.2.16 lapses before the employer evaluating tender, the contractor reserves the right to review the price based on Consumer Price Index (CPI).

C.2.16.4 Where a tender submission is to be substituted, a tenderer must submit a substitute tender in accordance with the requirements of C.2.13 with the packages clearly marked as "SUBSTITUTE".

C.2.17 Clarification of tender offer after submission

Provide clarification of a tender offer in response to a request to do so from the employer during the evaluation of tender offers. This may include providing a breakdown of rates or prices and correction of arithmetical errors by the adjustment of certain rates or item prices (or both). No change in the competitive position of tenderers or substance of the tender offer is sought, offered, or permitted.

Note: Sub-clause C.2.17 does not preclude the negotiation of the final terms of the contract with a preferred tenderer following a competitive selection process, should the Employer elect to do so.

C.2.18 Provide other material

C.2.18.1 Provide, on request by the employer, any other material that has a bearing on the tender offer, the tenderer's commercial position (including notarized joint venture agreements), preferencing arrangements, or samples of materials, considered necessary by the employer for the purpose of a full and fair risk assessment.

Should the tenderer not provide the material, or a satisfactory reason as to why it cannot be provided, by the time for submission stated in the employer's request, the employer may regard the tender offer as non-responsive.

C.2.18.2 Dispose of samples of materials provided for evaluation by the employer, where required.

C.2.19 Inspections, tests, and analysis

Provide access during working hours to premises for inspections, tests and analysis as provided for in the tender data.

C.2.20 Submit securities, bonds, and policies

If requested, submit for the employer's acceptance before formation of the contract, all securities, bonds, guarantees, policies, and certificates of insurance required in terms of the conditions of contract identified in the contract data.

C.2.21 Check final draft

Check the final draft of the contract provided by the employer within the time available for the employer to issue the contract.

C.2.22 Return of other tender documents

If so, instructed by the employer, return all retained tender documents within twenty-eight (28) days after the expiry of the validity period stated in the tender data.

C.2.23 Certificates

Include in the tender submission or provide the employer with any certificates as stated in the tender data.

C.3 The employer's undertakings

C.3.1 Respond to requests from the tenderer

C.3.1.1 Unless otherwise stated in the tender Data, respond to a request for clarification received up to five (5) working days before the tender closing time stated in the Tender Data and notify all tenderers who collected tender documents.

C.3.1.2 Consider any request to make a material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used to prequalify a tenderer to submit a tender offer in terms of a previous procurement process and deny any such request if as a consequence:

a) an individual firm, or a joint venture as a whole, or any individual member of the joint venture fails to meet any of the collective or individual qualifying requirements;

b) the new partners to a joint venture were not prequalified in the first instance, either as individual firms or as another joint venture; or

c) in the opinion of the Employer, acceptance of the material change would compromise the outcome of the prequalification process.

C.3.2 Issue Addenda

If necessary, issue addenda that may amend or amplify the tender documents to each tenderer during the period from the date that tender documents are available until three (3) working days before the tender closing time stated in the Tender Data. If, as a result a tenderer applies for an extension to the closing time stated in the Tender Data, the Employer may grant such extension and, shall then notify all tenderers who collected tender documents.

C.3.3 Return late tender offers

Return tender offers received after the closing time stated in the Tender Data, unopened, (unless it is necessary to open a tender submission to obtain a forwarding address), to the tenderer concerned.

C.3.4 Opening of tender submissions

C.3.4.1 Unless the two-envelope system is to be followed, open valid tender submissions in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data. Tender submissions for which acceptable reasons for withdrawal have been submitted will not be opened.

C.3.4.2 Announce at the meeting held immediately after the opening of tender submissions, at a venue indicated in the tender data, the name of each tenderer whose tender offer is opened and, where applicable, the total of his prices, number of points claimed for its BBBEE status level and time for completion for the main tender offer only.

C.3.4.3 Make available the record outlined in C.3.4.2 to all interested persons upon request.

C.3.5 Two-envelope system

C.3.5.1 Where stated in the tender data that a two-envelope system is to be followed, open only the technical proposal of valid tenders in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data and announce the name of each tenderer whose technical proposal is opened.

C.3.5.2 Evaluate functionality of the technical proposals offered by tenderers, then advise tenderers who remain in contention for the award of the contract of the time and place when the financial proposals will be opened. Open only the financial proposals of tenderers, who score in the functionality evaluation more than the minimum number of points for functionality stated in the tender data, and announce the score obtained for the technical proposals and the total price and any points claimed on BBBEE status level. Return unopened financial proposals to tenderers whose technical proposals failed to achieve the minimum number of points for functionality.

C.3.6 Non-disclosure

Not disclose to tenderers, or to any other person not officially concerned with such processes, information relating to the evaluation and comparison of tender offers, the final evaluation price and recommendations for the award of a contract, until after the award of the contract to the successful tenderer.

C.3.7 Grounds for rejection and disqualification

Determine whether there has been any effort by a tenderer to influence the processing of tender offers and instantly disqualify a tenderer (and his tender offer) if it is established that he engaged in corrupt or fraudulent practices.

C.3.8 Test for responsiveness

C.3.8.1 Determine, after opening and before detailed evaluation, whether each tender offer properly received:

a) complies with the requirements of these Conditions of Tender,
b) has been properly and fully completed and signed, and
c) is responsive to the other requirements of the tender documents.

C.3.8.2 A responsive tender is one that conforms to all the terms, conditions, and specifications of the tender documents without material deviation or qualification. A material deviation or qualification is one which, in the Employer's opinion, would:

a) detrimentally affect the scope, quality, or performance of the works, services or supply identified in the Scope of Work,
b) significantly change the Employer's or the tenderer's risks and responsibilities under the contract, or
c) affect the competitive position of other tenderers presenting responsive tenders if it were to be rectified.

Reject a non-responsive tender offer, and not allow it to be subsequently made responsive by correction or withdrawal of the non-conforming deviation or reservation.

C.3.9 Arithmetical errors, omissions, and discrepancies

C.3.9.1 Check responsive tenders for discrepancies between amounts in words and amounts in figures. Where there is a discrepancy between the amounts in figures and the amount in words, the amount in words shall govern.

C.3.9.2 Check the highest ranked tender or tenderer with the highest number of tender evaluation points after the evaluation of tender offers in accordance with C.3.11 for:

a) the gross misplacement of the decimal point in any unit rate;
b) omissions made in completing the pricing schedule or bills of quantities; or c) arithmetic errors in:

(i) line item totals resulting from the product of a unit rate and a quantity in bills of quantities or schedules of prices; or
(ii) the summation of the prices.

C.3.9.3 Notify the tenderer of all errors or omissions that are identified in the tender offer and either confirm the tender offer as tendered or accept the corrected total of prices.

C.3.9.4 Where the tenderer elects to confirm the tender offer as tendered, correct the errors as follows:
a) If bills of quantities or pricing schedules apply and there is an error in the line item total resulting from the product of the unit rate and the quantity, the line item total shall govern, and the rate shall be corrected. Where there is an obviously gross misplacement of the decimal point in the unit rate, the line item total as quoted shall govern, and the unit rate shall be corrected.
b) Where there is an error in the total of the prices either as a result of other corrections required by this checking process or in the tenderer's addition of prices, the total of the prices shall govern and the tenderer will be asked to revise selected item prices (and their rates if bills of quantities apply) to achieve the tendered total of the prices.

C.3.10 Clarification of a tender offer
Obtain clarification from a tenderer on any matter that could give rise to ambiguity in a contract arising from the tender offer.

C.3.11 Evaluation of tender offers
The Standard Conditions of Tender standardize the procurement processes, methods, and procedures from the time that tenders are invited to the time that a contract is awarded. They are generic in nature and are made project specific through choices that are made in developing the Tender Data associated with a specific project.

Conditions of tender are by definition the document that establishes a tenderer’s obligations in submitting a tender and the employer’s undertakings in soliciting and evaluating tender offers. Such conditions establish the rules from the time a tender is advertised to the time that a contract is awarded and require employers to conduct the process of offer and acceptance in terms of a set of standard procedures.

The CIDB Standard Conditions of Tender are based on a procurement system that satisfies the following system requirements:	
Requirement	Qualitative interpretation of goal
Fair	The process of offer and acceptance is conducted impartially without bias, providing simultaneous and timely access to participating parties to the same information.
Equitable	Terms and conditions for performing the work do not unfairly prejudice the interests of the parties.
Transparent	The only grounds for not awarding a contract to a tenderer who satisfies all requirements are restrictions from doing business with the employer, lack of capability or capacity, legal impediments and conflicts of interest.
Competitive	The system provides for appropriate levels of competition to ensure cost effective and best value outcomes.
Cost effective	The processes, procedures and methods are standardized with sufficient flexibility to attain best value outcomes in respect of quality, timing and price, and least resources to effectively manage and control procurement processes.

The activities associated with evaluating tender offers are as follows:

a) Open and record tender offers received
b) Determine whether or not tender offers are complete
c) Determine whether or not tender offers are responsive
d) Evaluate tender offers

e) Determine if there are any grounds for disqualification
f) Determine acceptability of preferred tenderer
g) Prepare a tender evaluation report
h) Confirm the recommendation contained in the tender evaluation report

C.3.11.1 General

The employer must appoint an evaluation panel of not less than three persons conversant with the proposed scope of works to evaluate each responsive tender offer using the tender evaluation methods and associated evaluation criteria and weightings that are specified in the tender data.

C.3.12 Insurance provided by the employer

If requested by the proposed successful tenderer, submit for the tenderer's information the policies and / or certificates of insurance which the conditions of contract identified in the contract data, require the employer to provide.

C.3.13 Acceptance of tender offer

Accept the tender offer; if in the opinion of the employer, it does not present any risk and only if the tenderer:

a) is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement;
b) can, as and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract;
c) has the legal capacity to enter into the contract;
d) is not; , in receivership, under Business Rescue as provided for in chapter 6 of the Companies Act No. 2008, bankrupt or being wound up, has his/her affairs administered by a court or a judicial officer, has suspended his/her business activities or is subject to legal proceedings in respect of any of the foregoing;
e) complies with the legal requirements, if any, stated in the tender data; and
f) is able, in the opinion of the employer, to perform the contract free of conflicts of interest.

C.3.14 Prepare contract documents

C.3.14.1 If necessary, revise documents that shall form part of the contract and that were issued by the employer as part of the tender documents to take account of:
a) addenda issued during the tender period,
b) inclusion of some of the returnable documents and
c) other revisions agreed between the employer and the successful tenderer.

C.3.14.2 Complete the schedule of deviations attached to the form of offer and acceptance, if any.

C.3.15 Complete adjudicator's contract

Unless alternative arrangements have been agreed or otherwise provided for in the contract, arrange for both parties to complete formalities for appointing the selected adjudicator at the same time as the main contract is signed.

C.3.16 Registration of the award

An employer must, within twenty-one (21) working days from the date on which a contractor's offer to perform a construction works contract is accepted in writing by the employer, register and publish the award on the CIDB Register of Projects.

C.3.17 Provide copies of the contracts

Provide to the successful tenderer the number of copies stated in the Tender Data of the signed copy of the contract as soon as possible after completion and signing of the form of offer and acceptance.

C.3.18 Provide written reasons for actions taken

Provide upon request written reasons to tenderers for any action that is taken in applying these conditions of tender but withhold information which is not in the public interest to be divulged, which is considered to prejudice the legitimate commercial interests of tenderers or might prejudice fair competition between tenderers.

Part T2: Returnable Documents

PART T2: RETURNABLE DOCUMENTS 36

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T2.2 RETURNABLE SCHEDULES 38

T2.1 List of Returnable Documents

The tenderer must complete the following Returnable Documents in non-erasable **black ink**:

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Schedule 27: Schedule of Imported Equipment 90

T2.2 Returnable Schedules

Schedule 1: Compulsory Enterprise questionnaire

The following particulars must be furnished. In the case of a joint venture, separate enterprise questionnaires in respect of each partner must be completed and submitted.

Section 1: Name of enterprise: …

Section 2: VAT registration number, if any: …

Section 3: CIDB registration number, if any: …

Section 4a: National Treasury Central Supplier Database registration number: … … … … … … … … … … … … …

Section 4b: SARS Tax Compliance Status PIN: …

Section 5: Particulars of sole proprietors and partners in partnerships

Name*	**Identity number***	**Personal income tax number***

* Complete only if sole proprietor or partnership and attach separate page if more than 3 partners

Section 6: Particulars of companies and close corporations

Company registration number**… …**

Close corporation number**… …**

Tax reference number**… …**

Section 7: MBD4 – Attached to this document

Section 8: MBD6 – Attached to this document

Section 9: MBD8 – Attached to this document

Section 10: MBD9 – Attached to this document

Section 11: Foreign Bidding Suppliers Is tenderer the accredited representative in South Africa for the Goods / Services / Works offered?	☐Yes ☐No If yes, enclose proof
Is tenderer a foreign based supplier for the Goods / Services / Works offered?	☐Yes ☐No If yes, answer the Questionnaire to Bidding Foreign Suppliers (below)
Questionnaire to Bidding Foreign Suppliers	
a) Is the tenderer a resident of the Republic of South Africa or an entity registered in South Africa?	☐Yes ☐No
b) Is the tenderer a resident of the Republic of South Africa or an entity registered in South Africa?	☐Yes ☐No
c) Does the tenderer have a permanent establishment in the Republic of South Africa?	☐Yes ☐No
d) Does the tenderer have any source of income in the Republic of South Africa?	☐Yes ☐No
e) Is the tenderer liable in the Republic of South Africa for any form of taxation?	☐Yes ☐No

The undersigned, who warrants that he / she is duly authorised to do so on behalf of the enterprise:

i) authorizes the Employer to obtain a tax clearance certificate from the South African Revenue Services that my / our tax matters are in order;

ii) confirms that the neither the name of the enterprise or the name of any partner, manager, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears on the Register of Tender Defaulters established in terms of the Prevention and Combating of Corrupt Activities Act of 2004 or Database of Restricted Suppliers;

iii) confirms that no partner, member, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears, has within the last five years been convicted of fraud or corruption;

iv) confirms that I / we are not associated, linked or involved with any other tendering entities submitting tender offers and have no other relationship with any of the tenderers or those responsible for compiling the scope of work that could cause or be interpreted as a conflict of interest; and

v) confirms that the contents of this questionnaire are within my personal knowledge and are to the best of my belief both true and correct.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 2: Clarification meeting attendance certificate

Refer to tender conditions C.2.7 in section T1.2 Tender data

This is to certify that I/we, (the representative(s)) .....

representing (the tenderer) .....

of address .....

.....

.....

.....

Telephone and cellphone number .....

fax number .....

on (date) .....

attended the clarification meeting, have examined the Site of the Works and its surroundings for which I/we am/are submitting this Tender and have, so far as is practicable, familiarized myself/ourselves with all the information, risks, contingencies and other circumstances which may influence of affect my/our Tender.

Attendance of the above person(s) at the Clarification Meeting is confirmed by:

EMPLOYER'S AGENT / REPRESENTATIVE: . (Name) ……

SIGNED BY EMPLOYER'S AGENT / REPRESENTATIVE: ……

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 3: Certificate of Independent Tender determination (MBD9)

I, the undersigned, in submitting this tender for **TENDER NO. 13/2026: UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1**
in response to the invitation for the tender made by the Langeberg Municipality, do hereby make the following statements that I certify to be true and complete in every respect:

I certify, on behalf of _____ that:
(Name of Tenderer)

1. I have read, and I understand the contents of this Certificate;
2. I understand that this tender will be disqualified if this Certificate is found not to be true and complete in every respect;
3. I am authorized by the tenderer to sign this Certificate, and to submit this tender on behalf of the tenderer;
4. Each person whose signature appears on this tender has been authorized by the tenderer to determine the terms of, and to sign, the tender, on behalf of the tenderer;
5. For the purposes of this Certificate and this tender, I understand that the word "competitor" shall include any individual or organization, other than the tenderer, whether affiliated with the tenderer or not, who:
   (a) has been requested to submit a tender in response to this invitation to tender;
   (b) could potentially submit a tender in response to this invitation to tender, based on their qualifications, abilities, or experience; and
   (c) provides the same goods and services as the tenderer and/or is in the same line of business as the tenderer;
6. The tenderer has arrived at this tender independently from, and without consultation, communication, agreement, or arrangement with any competitor. However, communication between partners in a joint venture or consortium[1] will not be construed as collusive tendering;
7. In particular (without limiting the generality of paragraph 6 above) there has been no consultation, communication, agreement, or arrangement with any competitor regarding:
   (a) prices;
   (b) geographical area where product or service will be rendered (market allocation);
   (c) methods, factors, or formulas used to calculate prices;
   (d) the intention or decision to submit or not to submit a tender;
   (e) the submission of a tender which does not meet the specifications and conditions of the tender; or
   (f) tendering with the intention not to win the tender;
8. In addition, there have been no consultations, communications, agreements, or arrangements with any competitor regarding the quality, quantity, specifications and conditions or delivery particulars of the products or services to which this invitation to tender relates;
9. The terms of this tender have not been, and will not be, disclosed by the tenderer, directly or indirectly, to any competitor, prior to the date and time of the official tender opening or of the awarding of the contract;
10. I am aware that , in addition and without prejudice to any other remedy provided to combat any restrictive practices related to tenders and contracts, tenders that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No. 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No. 12 of 2004 or any other applicable legislation.

[1]Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill, and knowledge in an activity for the execution of a contract.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 4: Certificate of Authority (for Companies/Joint Ventures/etc.)

Assurance shall be given at the time of submission of the tender that the tender has been signed by someone properly authorised thereto by resolution of the Directors, Members or Partners. Tenderers shall submit with their tenders the following information:

Single Company, Close Corporation or Partnership

Signatories for companies shall confirm their authority by attaching to this form a copy of the relevant resolution of the board of directors, duly signed and dated.

By resolution of the board of directors taken on (*Date*) .....
Mr/Ms (*Print Name*) .....
has been duly authorized to sign all documents in connection with this tender / contract on behalf of .....
(*Print Company Name*).....
.....
Signed on behalf of Company .....
In his/her capacity as.....
Date.....

Joint Ventures

We, the undersigned, are submitting this tender offer in joint venture and hereby authorize;
Mr/Ms ..... , authorised signatory
of the company, close corporation, or partnership.....
acting in the capacity of lead partner, to sign all documents in connection with the tender offer and any contract resulting from it on our behalf.

Date.....

NAME OF FIRM	ADDRESS	DULY AUTHORISED SIGNATORY
Lead partner		Signature, Name &Designation
		Signature, Name &Designation
		Signature, Name &Designation

Note: A copy of the Joint Venture Agreement, showing clearly the **percentage contribution of each partner** to the joint venture, shall be appended to this schedule. Lead partner need to be clearly stated.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 5: Declaration of Tenderer's past Supply Chain Management practices (MBD8)

Where the entity tendering is a joint venture, each party to the joint venture must sign a declaration in terms of the Municipal Finance Management Act, 56 of 2003, and attach it to this schedule.

1 The tender offer of any tenderer may be rejected if that tenderer or any of its directors/members have:

a) abused the municipality's / municipal entity's supply chain management system or committed any improper conduct in relation to such system;
b) been convicted for fraud or corruption during the past five years;
c) willfully neglected, reneged on or failed to comply with any government, municipal or other public sector contract during the past five years; or
d) been listed in the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004).

2 In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.

Item	Question	Yes	No
2.1	Is the Tenderer or any of its directors listed on the National Treasury's Database of Restricted Suppliers as a company or person prohibited from doing business with the public sector? (Companies or persons who are listed on this Database were informed in writing of this restriction by the Accounting Officer/Authority of the institution that imposed the restriction after the *audi alteram partem* rule was applied). **The Database of Restricted Suppliers now resides on the National Treasury's website www.treasury.gov.za and can be accessed by clicking on its link at the bottom of the home page.**	Yes ☐	No ☐
2.1.1	If so, furnish particulars:		
2.2	Is the Tenderer or any of its directors listed on the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act, 12 of 2004? **The Register for Tender Defaulters can be accessed on the National Treasury's website (www.treasury.gov.za) by clicking on its link at the bottom of the home page.**	Yes ☐	No ☐
2.2.1	If so, furnish particulars:		
2.3	Was the Tenderer or any of its directors convicted by a court of law (including a court of law outside the Republic of South Africa) for fraud or corruption during the past five years?	Yes ☐	No ☐
2.3.1	If so, furnish particulars:		
2.4	Does the Tenderer or any of its directors owe any municipal rates and taxes or municipal charges to the municipality / municipal entity, or to any other municipality / municipal entity, that is in arrears for more than three months?	Yes ☐	No ☐

2.4.1	If so, furnish particulars:		
2.5	Was any contract between the Tenderer and the municipality / municipal entity or any other organ of state terminated during the past five years on account of failure to perform on or comply with the contract?	Yes ☐	No ☐
2.5.1	If so, furnish particulars:		

I, _____, the undersigned,
(full name in block letters)

certify that the information furnished on this declaration form is true and correct, and accept that, in addition to cancellation of a contract, action may be taken against me should this declaration prove to be false.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 6: Declaration of interest – State Employees (MBD 4 amended)

- No bid will be accepted from:
  - 1.1 persons in the service of the state[1], or
  - 1.2 if the person is not a natural person, of which any director, manager or principal shareholder[2] or stakeholder is in the service of the state, or
  - 1.3 from persons, or entities of which any director, manager or principal shareholder or stakeholder, has been in the service of the Langeberg Municipality during the twelve (12) months after the Langeberg Municipality employee has left the employ of the Langeberg Municipality, or
  - 1.4 from an entity who has employed a former Langeberg Municipality employee who was at a level of T14 of higher at the time of leaving the LANGEBERG Municipality's employ and involved in any of the Langeberg Municipality's bid committees for the bid submitted, if:
  - 1.4.1 the Langeberg Municipality employee left the Langeberg Municipality's employment voluntarily, during a period of twelve (12) months after the Langeberg Municipality employee has left the employ of the Langeberg Municipality;
  - 1.4.2 the Langeberg Municipality employee left the Langeberg Municipality's employment whilst facing disciplinary action by the Langeberg Municipality, during a period of twenty-four (24) months after the Langeberg Municipality employee has left the employ of the Langeberg Municipality, or any other period prescribed by applicable legislative provisions, after having left the Langeberg Municipality's employ.

- Any person, having a kinship with persons in the service of the state, including a blood relationship, may make an offer or offers in terms of this invitation to bid. In view of possible allegations of favouritism, should the resulting bid, or part thereof, be awarded to persons connected with or related to persons in service of the state, it is required that the tenderer or their authorised representative declare their position in relation to the evaluating/adjudicating authority.

3 In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.

3.1 Full Name of tenderer or his or her representative:……....

3.2 Identity Number:……

3.3 Position occupied in the Company (director, trustee, shareholder[2]):……

3.4 Company or Close Corporation Registration Number:……

3.5 Tax Reference Number:……

3.6 VAT Registration Number:……

3.7 The names of all directors / trustees / shareholders members, their individual identity numbers and state employee numbers must be indicated in paragraph 4 below.

3.8 Are you presently in the service of the state? **YES / NO**

3.8.1 If yes, furnish particulars:
……
……
……

3.9 Have you been in the service of the state for the past twelve months? **YES / NO**

3.9.1 If yes, furnish particulars:
……

……
……

3.10 Do you have any relationship (family, friend, other) with persons in the service of the state and who may be involved with the evaluation and or adjudication of this bid? **YES / NO**

3.10.1 If yes, furnish particulars:
……
……
……
……

3.11 Are you, aware of any relationship (family, friend, other) between any other supplier and any persons in the service of the state who may be involved with the evaluation and or adjudication of this bid? **YES / NO**

3.11.1 If yes, furnish particulars
……
……
……
……

3.12 Are any of the company's directors, trustees, managers, principle shareholders or stakeholders in service of the state? **YES / NO**

3.12.1 If yes, furnish particulars:
……
……
……
……

3.13 Are any spouse, child or parent of the company's directors, trustees, managers, principle shareholders or stakeholders in service of the state? **YES / NO**

3.13.1 If yes, furnish particulars:
……
……
……
……

13.4 Do you or any of the directors, trustees, managers, principle shareholders, or stakeholders of this company have any interest in any other related companies or business whether or not they are bidding for this contract? **YES / NO**

3.14.1 If yes, furnish particulars:
……
……
……
……

3.15 Have you, or any of the directors, trustees, managers, principle shareholders, or stakeholders of this company been in the service of the LANGEBERG Municipality in the past twelve months? **YES / NO**

3.15.1 If yes, furnish particulars:
……
……
……
……

3.16 Do you have any employee/s who was/were in the service of the LANGEBERG Municipality at a level of T14 or higher at the time they left the employ of the LANGEBERG Municipality, and who was involved in any of the LANGEBERG Municipality's bid committees for this bid? **YES / NO**

3.16.1 If yes, furnish particulars:
……
……
……

4. Full details of directors / trustees / members / shareholders.

Full Name	Identity Number	State Employee Number

If the above table does not sufficient to provide the details of all directors / trustees / shareholders, please append full details to the tender submission.

The tenderer hereby certifies that the information set out in this schedule and/or attached thereto is true and correct, and acknowledges that failure to properly and truthfully complete this schedule may result in the tender being disqualified, and/or (in the event that the tenderer is successful) the cancellation of the contract, restriction of the tenderer or the exercise by the employer of any other remedies available to it

[1] MSCM Regulations: "in the service of the state" means to be –
- ***(a) a member of –***
  - ***(i) any municipal council;***
  - ***(ii) any provincial legislature; or***
  - ***(iii) the national Assembly or the national Council of provinces;***
- ***(b) a member of the board of directors of any municipal entity;***
- ***(c) an official of any municipality or municipal entity;***
- ***(d) an employee of any national or provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No.1 of 1999);***
- ***(e) an executive member of the accounting authority of any national or provincial public entity; or***
- ***(f) an employee of Parliament or a provincial legislature.***

[2] Shareholder" means a person who owns shares in the company and is actively involved in the management of the company or business and exercises control over the company.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

LANGEBERG MUNICIPALITY

TENDER NO. 13/2026

UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1

Schedule 7: Authorisation for the deduction of outstanding amounts owed to the Langeberg Municipality

To: THE MUNICIPAL MANAGER, LANGEBERG MUNICIPALITY

From: _____
(Name of tenderer)

The tenderer:

a) hereby acknowledges that according to SCM Regulation 38(1)(d)(i) the Municipal Manager may reject the tender of the tenderer if any municipal rates and taxes or municipal service charges owed by the tenderer (or any of its directors/members/partners) to the LANGEBERG MUNICIPALITY, or to any other municipality or municipal entity, are in arrears for more than 3 (three) months; and
b) therefore hereby agrees and authorises the LANGEBERG MUNICIPALITY to deduct the full amount outstanding by the Tenderer or any of its directors/members/partners from any payment due to the tenderer; and
c) confirms the information as set out in the tables below for the purpose of giving effect to b) above;
d) The tenderer hereby certifies that the information set out in this schedule and/or attached hereto is true and correct, and acknowledges that failure to properly and truthfully complete this schedule may result in steps being taken against the tenderer, the tender being disqualified, and/or (in the event that the tenderer is successful) the cancellation of the contract and/or steps in terms of abuse of the Supply Chain Management Policy.

Physical **Business** address of the Tenderer	Municipal Account number(s)

If there is not enough space for all the names, please attach the additional details to the Tender Document

Name of Director / Member / Partner	Identity Number	Physical **residential** address of Director / Member / Partner	Municipal Account number(s)

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 8: Declaration in respect of compliance with labour legislation

Tenderers must be registered with the relevant Bargaining Council as contained in the tender conditions and must append to this schedule a certificate of compliance / letter of good standing in terms of the relevant Government Gazette that indicates compliance / validity at the time of tender award.

Each party to a Consortium/Joint Venture shall append separate certificates in the above regard.

Declaration in respect of labour legislation

The tenderer, by signing this schedule, declares that it will comply with all labour legislation, as may be applicable.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 9: Declaration for procurement above R10 million (MBD5)

For all procurement expected to exceed R10 million (all applicable taxes included), bidders must complete the following questionnaire:

1. Are you by law required to prepare annual financial statements for auditing?***YES / NO**

    1.1. If yes, submit audited annual financial statements for the past three years or since the date of establishment if established during the past three years.

    ……
    ……

2. Do you have any outstanding undisputed commitments for municipal services towards any municipality for more than three months or any other service provider in respect of which payment is overdue for more than 30 days?***YES / NO**

    2.1 If no, this serves to certify that the bidder has no undisputed commitments for municipal services towards any municipality for more than three months or other service provider in respect of which payment is overdue for more than 30 days.

    2.2 If yes, provide particulars.

    ……
    ……

3. Has any contract been awarded to you by an organ of state during the past five years, including particulars of any material non-compliance or dispute concerning the execution of such contract?***YES / NO**

    3.1 If yes, furnish particulars

    ……
    ……

4. Will any portion of goods or services be sourced from outside the Republic, and, if so, what portion and whether any portion of payment from the municipality / municipal entity is expected to be transferred out of the Republic?***YES / NO**

    4.1 If yes, furnish particulars

    ……
    ……

** Delete if not applicable*

CERTIFICATION:
I, THE UNDERSIGNED (NAME)……
CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS CORRECT. I ACCEPT THAT THE STATE MAY ACT AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 10: Confirmation of Central Supplier Database (CSD) registration

CENTRAL SUPPLIER DATABASE REGISTRATION		
COMPANY NAME	**REGISTERED YES/NO**	**REGISTRATION NUMBER IF APPLICABLE**

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 11: Tax Clearance Certificate

SARS Tax Compliance Status PIN	
COMPANY NAME	**SARS Tax Compliance Status PIN**

Bidders are required to submit their unique personal identification number (pin) issued by SARS to enable the organ of state to view the taxpayers' profile and tax status.

Application for the tax compliance status (TCS) certificate or pin may also be made via e-filing. In order to use this provision, taxpayers will need to register with SARS as e-filers through the website www.sars.gov.za.

Bidders may also submit a printed TCS certificate together with the bid (valid and original). In Bids where Consortia/Joint Venture/Sub-contractors are involved each party must submit a separate and Original Valid Tax Clearance Certificate.

Failure to submit proof of good standing with SARS (Tax Clearance Certificate) will result in the invalidation of the tender/bid. **Certified copies of the Tax clearance Certificate will not be acceptable.**

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 12: Confirmation of Contractor Enterprise Registration

CIDB REGISTRATION

We hereby confirm our registration on Construction Industry Development Board (CIDB) Contractor Database:

COMPANY NAME	CIDB CONTRACTOR GRADING DESIGNATION	CRS REGISTRATION NUMBER AS APPLICABLE

I/We attach a printed copy of the Active Contractor's Listing off the CIDB website www.cidb.org.za as documentary proof of the Contractor's Registration issued by the Construction Industry Development Board (CIDB) to this schedule.

Where a tenderer satisfies CIDB Contractor grading designation requirements through joint venture formation, such tenderers must submit the Certificates of Contractor Registration in respect of each partner.

Failure to affix such documentation as proof of Contractor Enterprise registration as prescribed to this Schedule shall result in this tender not being further considered for the award of the Contract.

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 13: Tenderer's banking details

Notes to tenderer:

1. **The tenderer shall attach to this form a letter from the bank at which he declares he conducts his account. The contents of the bank's letter must state the credit rating that it, in addition to the information required below, accords to the tenderer for the business envisaged by this tender. The Employer will also do an independent Bank Rating investigation via the Employer's Agent's independent source.**
2. **The tenderer's banking details as they appear below shall be completed.**
3. **If the tenderer is a joint venture enterprise, details of all the members of the joint venture shall be similarly provided and attached to this form. The nominated bank account that will be used for this project need to be completed below. Only one bank account may be used, shown below.**

The method used to obtain a bank rating is an online service provided by ABSA bank. If the tendered contract period is three months or more, an average 3-month cash flow for each tender submitted will be calculated and used as input into the online service. This process ensure that an equivalent method is used when determining the bank ratings of each tenderer. The Employer will obtain codes from the relevant independent financial institutions. The evaluation of your offer will be based on the Bank Rating received from our own independent investigation and not the Bank Rating attached by the tenderer himself. This is to ensure a fair and equal evaluation of bids.

Bidders must provide their banking details below.

The tenderer shall provide the following:

Name of Account Holder: .....

Account Number: .....

Bank name: .....

Branch Number: .....

Bank and branch contact details .....

.....

.....

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 14: Schedule of work experience of Tenderer

The tenderer shall insert in the spaces provided below a list of completed contracts and those currently being undertaken with a scope of similar nature. This information is deemed to be material to the award of the Contract.

Projects of a similar scope and nature is regarded as:

- Pump stations with a capacity of 100ℓ/s or greater
- Water/Wastewater Treatment Works with a capacity of 1Mℓ/d or greater

Please note that no tenderer will be contacted to clarify any experience or construction equipment, or plant submitted with this bid. If insufficient information is shown, the tenderer will not be contacted for clarification.
The information provided in this schedule will be utilized to calculate the pre-qualification functionality scores. Tenderers must have successfully completed (please note that current incomplete projects will not be included in the evaluation) at least 5 projects of a similar scope and nature in the last 10 years to score full marks on this criterion.

A detailed list of successfully completed projects must be completed below (or attached to this schedule).

COMPLETED SIMILAR CONTRACTS				
EMPLOYER (NAME, TEL No AND FAX No)	CONSULTING ENGINEER (NAME, TEL No AND FAX No)	NATURE OF WORK (SPECIFY CAPACITY OF WORKS)	VALUE OF WORK R(m)	DATE COMPLETED

CURRENT SIMILAR PROJECTS				
EMPLOYER (NAME, TEL No AND FAX No)	CONSULTING ENGINEER (NAME, TEL No AND FAX No)	NATURE OF WORK (SPECIFY CAPACITY OF WORKS)	VALUE OF WORK R(m)	DATE COMPLETED

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 15: Details of qualifications and experience of staff

Tenderers shall set out in the Schedule hereunder details of the Construction Manager and General Foreman's experience in work of a similar nature to that for which their Tender is submitted. Detailed, project specific CV's to be included in this Schedule. Failure to do so during tender phase will lead to disqualification of tenderer.

Construction managers must have successfully **completed** (please note that current projects will not be included in the evaluation) at least 5 projects of a similar scope and nature in the last 10 years to score full marks on this criterion. Projects of a similar scope and nature is regarded as:

- Pump stations with a capacity of 100ℓ/s or greater
- Water/Wastewater Treatment Works with a capacity of 1Mℓ/d or greater

.

Please note that no tenderer will be contacted to clarify any experience or construction equipment, or plant submitted with this bid. If insufficient information is shown, the tenderer will **not** be contacted for clarification.

CONSTRUCTION MANAGER	**NAME**: ……			
CLIENT/CLIENT AGENT'S NAME AND CONTACT DETAILS	**NATURE OF WORK (SPECIFY CAPACITY OF WORKS)**	**POSITION HELD**	**VALUE OF WORK**	**YEAR COMPLETED**

GENERAL FOREMAN/CONSTRUCTION SUPERVISOR	NAME: ……			
CLIENT/CLIENT AGENT'S NAME AND CONTACT DETAILS	NATURE OF WORK (SPECIFY CAPACITY OF WORKS)	POSITION HELD	VALUE OF WORK	YEAR COMPLETED

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 16: Schedule of construction equipment

The tenderer shall state below what construction equipment will be available for this Contract. The tenderer shall differentiate, if applicable, between construction equipment immediately available and construction equipment which will become available by virtue of outstanding orders, and indicate what further construction equipment will be acquired or hired for the work should he be awarded the Contract.

CONSTRUCTION EQUIPMENT IMMEDIATELY AVAILABLE

DESCRIPTION, SIZE, CAPACITY	NUMBER

CONSTRUCTION EQUIPMENT ON ORDER
(State details of arrangements made, with delivery dates)

DESCRIPTION, SIZE, CAPACITY	NUMBER

CONSTRUCTION EQUIPMENT THAT WILL BE ACQUIRED OR HIRED
(State details of delivery arrangements)

DESCRIPTION, SIZE, CAPACITY	NUMBER

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 17: Preliminary programme

The tenderer shall attach a preliminary programme, reflecting the proposed sequence and tempo of execution of the various activities comprising the work for the Contract, to this page.

This programme shall be in the form of a bar chart (Gantt chart) or similar acceptable time/activity form reflecting the proposed sequence and tempo of the various activities and the quantities that will be carried out every week under each of the elements, comprising the work for this contract. The programme shall also indicate the point where the tenderer intends to commence work operations and the direction in which the work will proceed. The working hours shall be indicated.

The tenderer shall also take into account the additional requirements stated in the Project Specifications when drawing up the programme.

Details of the preliminary programme shall be appended to this Schedule.

Number of sheets, appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 18: Proposed work plan

The tenderer shall append their proposed work plan to this Schedule.

It should be noted that while a programme may form part of the required work plan, more than a programme is expected in response to this requirement. The work plan must indicate the approach and methodology that the tenderer intends following to reach the required outcomes. The work plan must show that the tenderer has comprehended the Scope of Work and has good insight as to what actions or activities are required to comply with the Employer's objectives.

The proposed work plan must not exceed two A4 pages.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 19: Schedule of estimated monthly expenditure

The tenderer shall state his estimated expenditure indicating the value of work done and materials not yet built into the Permanent Works for each month of the Contract period which he estimates will arise based on his preliminary programme and tendered rates, as set out in the table below. The total of the monthly amounts shall be equal to the tender sum.

MONTH	VALUE	MONTH	VALUE
1.	R	13.	R
2.	R	14.	R
3.	R	15.	R
4.	R	16.	R
5.	R	17.	R
6.	R	18.	R
7.	R	19.	R
8.	R	20.	R
9.	R	21.	R
10.	R	22.	R
11.	R	23.	R
12.	R	24.	R
SUBTOTAL (MONTH 1-24)			R
CONTINGENCIES 10%)			R
SUBTOTAL			R
VAT (15%)			R
TOTAL (INCLUDING VAT @ 15%)			R

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 20: Schedule of sub-contractors

We notify you that it is our intention to employ the following sub-contractors for work (excluding work covered by provisional sums and contingencies) in this contract.

Acceptance of this tender shall not be construed as approval of all or any of the listed sub-contractors. Should any of the sub-contractors not be approved subsequent to acceptance of the tender, this shall in no way invalidate the contract, and the tendered unit rates for the various items making up the work activities shall remain final and binding.

Local Sub-Contractors must be utilized.

SUB-CONTRACTORS		
Sub-contractor's name	Work activities to be undertaken by the Sub-contractor	Estimated value of work (Rand)

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 21: Health and Safety plan

Tenderers are referred to the requirements of Clause C.2.18.4 in Part T1.2 Tender Data and shall append the required draft Health and Safety Plan to this Schedule.

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 22: Proposed deviations and qualifications by tenderer

The Tenderer should record any **proposed** deviations or qualifications he may wish to make to the tender documents in this Returnable Schedule. Alternatively, a tenderer may state such proposed deviations and qualifications in a covering letter attached to his tender and reference such letter in this schedule. Any proposed deviations or qualifications contained in a covering letter which is not referenced in this schedule will not be considered.

The Tenderer's attention is drawn to clause C.3.8 of the Standard Conditions of Tender referenced in the Tender Data regarding the Employer's handling of material deviations and qualifications.

If no deviations or qualifications are proposed, the schedule hereunder is to be marked NIL and signed by the Tenderer.

PAGE	CLAUSE OR ITEM	PROPOSED DEVIATION OR QUALIFICATION

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 23: Functionality criteria

The Tenderer shall provide information for the functionality criteria listed in this Returnable Schedule.

The Tenderer's attention is drawn to clause C.2.1.4.3 in the Tender Data for a more detailed explanation of the functionality criteria given in the table below and how the score will be calculated (with applicable values).

Please note that points scored for Quality (functionality) will not have an influence on the total tender evaluation points and will therefore not affect the ranking of the tenderers, it will only be regarded as a pre-qualification. The minimum points required to be eligible to tender is 70 out of a 100.

THE CRITERIA to be applied in evaluating the proposal is set out in the table below:

Calculate the points for functionality according to the following formula:

$$P_s = S_o/M_s \times A_p$$

Where P_s = Percentage scored for functionality by bid under consideration
S_o = Total score of bid/proposal under consideration
M_s = Maximum possible score = 500
A_p = percentage allocated for functionality = 100

Total points by bidder on functionality:

i) $P_{s(Criterion\ 1)}$ = (Indicator allocated/scored out of 5) x weight
ii) $P_{s(Criterion\ 2)}$ = (Indicator allocated/scored out of 5) x weight
$P_{s(TOTAL)}$ = $[(P_{s(Criterion\ 1)} + P_{s(Criterion\ 2)}) / 5] \times 100$

Criteria can be amended to suit project complexity or omitted if not applicable.

Criterion	Weight
1) Relevant Experience (Returnable Schedule 14)	50%
2) Construction manager Experience (Returnable Schedule 15)	50%
Total	**100%**

EVALUATION CRITERION 1

Tenderers must have successfully **completed** (please note that current projects will not be included in the evaluation) at least 5 projects of a similar scope and nature in the last 10 years to score full marks on this criterion. Refer to the table below for a measurement of how points will be awarded against this criterion.

A detailed list of successfully completed projects must be completed in/attached to **Schedule 14**.

Projects of a similar scope and nature is regarded as:

- Pump stations with a capacity of 100ℓ/s or greater
- Water/Wastewater Treatment Works with a capacity of 1Mℓ/d or greater

Please note that no tenderer will be contacted to clarify any experience or construction equipment, or plant submitted with this bid. If insufficient information is shown, the tenderer will **not** be contacted for clarification.

1. RELEVANT EXPERIENCE	
INDICATOR	**Evaluation Criteria for Relevant Experience:** (number of similar projects completed by the contractor in the last 10 years)
0	The tenderer has completed zero projects in the last 10 years
1	The tenderer has completed only 1 project in the last 10 years
2	The tenderer has completed exactly 2 projects in the last 10 years
3	The tenderer has completed exactly 3 projects in the last 10 years
4	The tenderer has completed exactly 4 projects in the last 10 years
5	The tenderer has completed 5 or more projects in the last 10 years

EVALUATION CRITERION 2

Detailed, project specific CV's to be included in **Schedule 15** of the Returnable Documents. Failure to do so during tender phase will lead to disqualification of tenderer.

Construction managers must have successfully **completed** (please note that current projects will not be included in the evaluation) at least 5 projects of a similar scope and nature in the last 10 years to score full marks on this criterion. Refer to the table below for a measurement of how points will be awarded against this criterion.

Projects of a similar scope and nature is regarded as:

- Pump stations with a capacity of 100ℓ/s or greater
- Water/Wastewater Treatment Works with a capacity of 1Mℓ/d or greater

Please note that no tenderer will be contacted to clarify any experience or construction equipment, or plant submitted with this bid. If insufficient information is shown, the tenderer will **not** be contacted for clarification.
If, during construction, the contractor wishes to replace the construction manager, the contractor will apply in writing to the Engineer as per clause 6.8 of FIDIC. Only similarly experienced and competent construction managers will be considered.

2. CONSTRUCTION MANAGER	
INDICATOR	**Evaluation Criteria for Construction manager:** (number of similar projects completed by the Construction manager in the last 10 years)
0	The Construction manager has completed zero projects in the last 10 years
1	The Construction manager has completed only 1 project in the last 10 years
2	The Construction manager has completed exactly 2 projects in the last 10 years
3	The Construction manager has completed exactly 3 or more projects in the last 10 years
4	The Construction manager has completed exactly 4 or more projects in the last 10 years
5	The Construction manager has completed 5 or more projects in the last 10 years

The functionality proposal will be evaluated individually on score sheets, by a representative evaluation panel according to the evaluation criteria indicated above. All service providers who scored less than 70 out of 100 points for functionality will not be considered further. At least 3 evaluators will evaluate the quality schedules separately.

NB: Points scored for Quality (functionality) will not have an influence on the total tender evaluation points.

Where the entity tendering is a Joint Venture the tender must be accompanied by a statement describing exactly what aspects of the work will be undertaken by each party to the joint venture (appended to Schedule 4, Part T2.2: Returnable Schedules).

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 24: Preference Schedule: Measuring B-BBEE

PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT REGULATIONS 2022
MBD 6.1

This preference form must form part of all tenders invited. It contains general information and serves as a claim form for preference points for specific goals.

NB: BEFORE COMPLETING THIS FORM, TENDERERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF THE TENDER AND PREFERENTIAL PROCUREMENT REGULATIONS, 2022

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1. GENERAL CONDITIONS

1.1 The following preference point systems are applicable to invitations to tender:

- the 80/20 system for requirements with a Rand value of up to R50 000 000 (all applicable taxes included); and
- the 90/10 system for requirements with a Rand value above R50 000 000 (all applicable taxes included).

1.2 **To be completed by the organ of state**

a) The applicable preference point system for this tender is the 80/20 preference point system.

b) The 80/20 preference point system will be applicable in this tender. The lowest/ highest acceptable tender will be used to determine the accurate system once tenders are received.

1.3 Points for this tender (even in the case of a tender for income-generating contracts) shall be awarded for:

(a) Price; and

(b) Specific Goals.

1.4 **To be completed by the organ of state:**

The maximum points for this tender are allocated as follows:

	POINTS
PRICE	80
SPECIFIC GOALS	20
Total points for Price and SPECIFIC GOALS	**100**

1.5 Failure on the part of a tenderer to submit proof or documentation required in terms of this tender to claim points for specific goals with the tender, will be interpreted to mean that preference points for specific goals are not claimed.

1.6 The organ of state reserves the right to require of a tenderer, either before a tender is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the organ of state.

2. DEFINITIONS

(a) **"tender"** means a written offer in the form determined by an organ of state in response to an invitation to provide goods or services through price quotations, competitive tendering process or any other method envisaged in legislation;

(b) **"price"** means an amount of money tendered for goods or services, and includes all applicable taxes less all unconditional discounts;

(c) **"rand value"** means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes;

(d) **"tender for income-generating contracts"** means a written offer in the form determined by an organ of state in response to an invitation for the origination of income-generating contracts through any method envisaged in legislation that will result in a legal agreement between the organ of state and a third party that produces revenue for the organ of state, and includes, but is not limited to, leasing and disposal of assets and concession contracts, excluding direct sales and disposal of assets through public auctions; and

(e) **"the Act"** means the Preferential Procurement Policy Framework Act, 2000 (Act No. 5 of 2000).

(f) "**Locality**" means the local tenderer that resides within the Langeberg Municipal area. Where the tenderer is the owner of the property, the municipal account must be registered in the trading name of the owner of the property. Where the tenderer is not the owner of the property (i.e. where the municipal account is not registered in the name of the tenderer), a valid Lease Agreement must be submitted. This does not have to be the tenderer's main commercial property and can be residential."

3. FORMULAE FOR PROCUREMENT OF GOODS AND SERVICES

3.1. **POINTS AWARDED FOR PRICE**

3.1.1 Application of preference point system

3.1.1.1 The Municipality will, in the tender documents, stipulate —

(a) the preference point system applicable; and
(b) any specific goal as envisaged in section 2(1)(d) and (e) of the Preferential Procurement Act.

3.1.1.2 If it is unclear whether the 80/20 or 90/10 preference point system applies—

(a) in the case of a tender to generate income or to dispose of or lease assets, the highest acceptable tender; or
(b) in the case of any other tender, the lowest acceptable tender, must be used to determine the applicable preference point system.

3.1.2 Points for Price: 80/20 preference point system for acquisition of goods or services with Rand value equal to or above R30 000 and up to R50 million

3.1.2.1 The following formula must be used to calculate the points out of 80 for price in respect of a tender with a Rand value equal to or above R30 000 and up to a Rand value of R50 million, inclusive of all applicable taxes:

$$Ps = 80\left(1 - \frac{Pt - P\,min}{P\,min}\right)$$

Where-

Ps = Points scored for price of tender under consideration;

Pt = Price of tender under consideration; and

Pmin = Price of lowest acceptable tender.

3.1.2.2 A maximum of 20 points may be awarded to a tenderer for the specified goals envisaged in section 2(1)(d) and (e) of the Act.

3.1.2.3 The points scored must be rounded off to the nearest two decimal places.

3.1.2.4 The contract must be awarded to the tenderer scoring the highest points.

3.1.3 Points for price: 90/10 preference point system for acquisition of goods or services with Rand value above R50 million

3.1.3.1 The following formula must be used to calculate the points out 90 for price in respect of a tender with a Rand value above R50 million, inclusive of all applicable taxes:

$$Ps = 90\left(1 - \frac{Pt - P\,min}{P\,min}\right)$$

Where-

Ps = Points scored for price of tender under consideration;

Pt = Price of tender under consideration; and

Pmin = Price of lowest acceptable tender.

3.1.3.2 A maximum of 10 points may be awarded to a tenderer for the specified goals envisaged in section 2(1)(d) and (e) of the Act.

3.1.3.3 The points scored must be rounded off to the nearest 2 decimal places.

3.1.3.4 The contract must be awarded to the tenderer scoring the highest points.

3.2. **FORMULAE FOR DISPOSAL OR LEASING OF STATE ASSETS AND INCOME GENERATING PROCUREMENT**

The following formula must be used to calculate the points for price in respect of a tender to generate income or to dispose of or lease assets, with a Rand value equal to, or above R 30 000 and up to a Rand value of R50 million, inclusive of all applicable taxes:

$$Ps = 80\left(1 + \frac{Pt - Pmax}{Pmax}\right)$$

Where-

Ps = Points scored for price of tender under consideration;

Pt = Price of tender under consideration; and

Pmax = Price of highest acceptable tender.

3.2.1 A maximum of 20 points may be awarded to a tenderer for the specified goals envisaged in section 2(1)(d) and (e) of the Act.

3.2.2 The points scored must be rounded off to the nearest 2 decimal places.

3.3.3 The contract must be awarded to the tenderer scoring the highest points.

3.3.4 Points for price:90/10 preference point system for tenders to generate income or to dispose of or lease assets with Rand value equal to or above R50 million

3.3.5 The following formula must be used to calculate the points for price in respect of a tender to generate income or to dispose of or lease assets, with a Rand value above R50 million, inclusive of all applicable taxes:

$$Ps = 90\left(1 + \frac{Pt - Pmax}{Pmax}\right)$$

Where-

Ps = Points scored for price of tender under consideration;

Pt = Price of tender under consideration; and

Pmax = Price of highest acceptable tender.

3.3.6 A maximum of 10 points may be awarded to a tenderer for the specified goals envisaged in section 2(1)(d) and (e) of the Act.

3.3.7 The points scored must be rounded off to the nearest 2 decimal places.

3.3.8 The contract must be awarded to the tenderer scoring the highest points.

4. POINTS AWARDED FOR SPECIFIC GOALS

4.1 The tendering conditions will stipulate the specific goals, as contemplated in section 2(1)(d)(ii) of the Preferential Procurement Act, be attained.

4.2 A maximum of 20 points (80/20 preference points system) or 10 (90/10) preference points system), will be allocated for specific goals. These goals are:

(a) contracting with persons, or categories of persons, historically disadvantaged by unfair discrimination on the basis of race, gender or disability (BBBEE);

(b) Promotion of tenderers located in the municipal area

4.3 Regarding par 4.2 (a) 50% of the 20/10 points will be allocated to promote this goal and points will be allocated in terms of the BBBEE scorecard as follows:

B-BBEE Status Level of Contributor	Number of Points for Preference (80/20)	Number of Points for Preference (90/10)
1	20	10
2	18	9
3	16	8
4	12	5
5	8	4
6	6	3
7	4	2
8	2	1
Non-compliant contributor	0	0

4.4 A tenderer must submit proof of its BBBEE status level contributor [scorecard].

4.5 A tenderer failing to submit proof of BBBEE status level of contributor –

4.5.1 may only score in terms of the 80/90-point formula for price; and

4.5.2 scores 0 points out of 10/5 BBBEE status level of contributor, which is in line with section 2 (1) (d) (i) of the Act, where the supplier or service provider did not provide proof thereof.

4.6 Regarding par 4.2 (b) 50% of the **20/10 points** will be allocated to promote this goal. Points will be allocated as follows.

Locality of tenderer	Points
Within the boundaries of the Langeberg municipality	**10/5**
Outside of the boundaries of the Langeberg municipality	0

4.7 The policy should not include Pre-qualification goals.

4.8 Any specific goal for which a point may be awarded, must be clearly specified in the invitation to submit a tender.

4.9 A tenderer failing to submit proof of required evidence to claim preferences for other specified goals, which is in line with section 2 (1) (d) (ii) of the Act.

4.9.1 may only score in terms of the 80/90-point formula for price; and

4.9.2 scores 0 points out of 10/5 of the relevant specific goals where the supplier or service provider did not stipulate.

4.10 The preference points scored by a tenderer must be added to the points scored for price.

4.11 The points scored must be rounded off to the nearest two decimal places.

4.12 The contract must be awarded to the tenderer scoring the highest procurement points.

Table 1: Specific goals for the tender and points claimed are indicated per the table below.

(Note to organs of state: Where either the 90/10 or 80/20 preference point system is applicable, corresponding points must also be indicated as such.

Note to tenderers: The tenderer must indicate how they claim points for each preference point system.)

The specific goals allocated points in terms of this tender	Number of points allocated (90/10 system) (To be completed by the organ of state)	Number of points allocated (80/20 system) (To be completed by the organ of state)	Number of points claimed (90/10 system) (To be completed by the tenderer)	Number of points claimed (80/20 system) (To be completed by the tenderer)
BBBEE preference points system	05	10		
Promotion of tenderers located in the municipal area	05	10		

5. DECLARATION WITH REGARD TO COMPANY/FIRM

Name of company/firm…….

5.1. Company registration number: ……...

5.2. TYPE OF COMPANY/ FIRM

☐ Partnership/Joint Venture / Consortium
☐ One-person business/sole propriety
☐ Close corporation
☐ Public Company
☐ Personal Liability Company
☐ (Pty) Limited
☐ Non-Profit Company
☐ State Owned Company

[TICK APPLICABLE BOX]

5.3. I, the undersigned, who is duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the specific goals as advised in the tender, qualifies the company/ firm for the preference(s) shown and I acknowledge that:

i) The information furnished is true and correct;

ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;

iii) In the event of a contract being awarded as a result of points claimed as shown in paragraphs 1.4 and 4.2, the contractor may be required to furnish documentary proof to the satisfaction of the organ of state that the claims are correct;

iv) If the specific goals have been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the organ of state may, in addition to any other remedy it may have –

(a) disqualify the person from the tendering process;

(b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;

(c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;

(d) recommend that the tenderer or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted from obtaining business from any organ of state for a period not exceeding 10 years, after the *audi alteram partem* (hear the other side) rule has been applied; and

(e) forward the matter for criminal prosecution, if deemed necessary.

…… **SIGNATURE(S) OF TENDERER(S)**
SURNAME AND NAME: ……
DATE: ……
ADDRESS: ……
……
……
……

Schedule 25: Record of addenda to tender documents

We confirm that the following communications received from the Employer before the submission of this tender offer, amending the tender documents, have been taken into account in this tender offer:

	Date	Title or Details
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Attach additional pages if more space is required.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

Schedule 26: Mechanical and Electrical Datasheets

MECHANICAL DATASHEETS

TECHNICAL DATA SHEET NO. **1.1**

Centrifugal Pumps

1.1.1 Filter Feed Pumps - 50P001 & 50P002

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.1.1.1	Manufacturer			
1.1.1.2	Max Pressure	m	26	
1.1.1.3	Min Pressure	m		
1.1.1.4	Maximum duty flow rate for pump	m^3/hr	280	
1.1.1.5	Minimum flow rate for pump	m^3/hr		
1.1.1.6	VSD		Required	
1.1.1.7	Pump delivery size	mm		
1.1.1.8	Pump suction size	mm		
1.1.1.9	Pump Casing material			
1.1.1.10	Wear plate			
1.1.1.11	Seal faces			
1.1.1.12	Impeller material			
1.1.1.13	Pump Shaft material			
1.1.1.14	Electric motor			
1.1.1.15	Make of motor			
1.1.1.16	Country of origin			
1.1.1.17	Type of motor		TEFC	
1.1.1.18	Motor rating	kW		
1.1.1.19	Rotational speed	rpm	≤ 1 500	
1.1.1.20	Enclosure rating		IP 55	

TECHNICAL DATA SHEET NO. **1.2**

Filter Media & Pressure Vessel

1.2.1 Filter Media - Gravel

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.2.1.1	Layers			
1.2.1.2	50 mm (Top Layer)		19.1 mm - 12.7 mm	
1.2.1.3	50 mm		6.4 mm – 3.2 mm	
1.2.1.4	50 mm		3.2 mm – 1.5 mm	
1.2.1.5	50 mm		6.4 mm – 3.2 mm	
1.2.1.6	50 mm		12.7 mm – 6.4 mm	
1.2.1.7	50 mm (Bottom Layer)		19.1 mm - 12.7 mm	

1.2.2 Filter Media - Sand

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.2.2.1	Type		Quartzitic	
1.2.2.2	Bed Depth – L	(m)	0.85	
1.2.2.3	Media Density - ρs	(kg/m^3)	>2500	
1.2.2.4	Fixed loose-bed Porosity - ε0		0.45	
1.2.2.5	Sphericity – Ψ		0.78	
1.2.2.6	Coefficient of uniformity – UC		>1.3	
1.2.2.7	Effective size – EC	(mm)	0.74	

1.2.3 Pressure Vessel

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.2.3.1	Number of pressure filters		3	
1.2.3.2	Internal Diameter	(m)	1.2m	
1.2.3.3	Total Area per filter	(kg/m^3)	$1.13m^2$	
1.2.3.4	Design Pressure		500kPa	
1.2.3.5	Design Code		PD5500 Cat.2 – Latest Edition	

1.2.3.6	SANS 347		Category SEP	
1.2.3.7	Filter Vessel Shell Length	(mm)	1000	
1.2.3.8	Media Retainer		Nozzle Plate from SA355 JR/AR	
1.2.3.9	Nozzle Density		22Nozzles/m^2	
1.2.3.10	Nozzle Type			
1.2.3.11	Material of Construction		BS EN10025-2-S355 JR	
1.2.3.12	Corrosion protection of the Vessel		Glass Flake Coated with a UV inhibitor	
1.2.3.13	Inlet		Top with the inlet pipe upwards	
1.2.3.14	Outlet		Bottom side	
1.2.3.15	Connections		As per P&ID and existing filters	
1.2.3.16	Flanges		SANS1123 Tbl.1000/3	
1.2.3.17	Max filtration rate per filter	m/hr	8.6	
1.2.3.18	Backwash Water Rate	m/hr	30	

TECHNICAL DATA SHEET NO. **1.3**

RSV Gate Valves

1.3.1 **DN200 (Manual)**

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.3.1.1	Manufacturer			
1.3.1.2	Data Sheet attached?		Yes	
1.3.1.3	Valve diameter	mm	200	
1.3.1.4	Operation		Manual	
1.3.1.5	Liquid		Water (clarifier sludge and clear water)	
1.3.1.6	Actuation/Control		Handwheel, clockwise close	
1.3.1.7	Connection		Flanged	
1.3.1.8	Pressure Class		PN10	
1.3.1.9	Spindle Length		Standard	
1.3.1.10	Material		Cast Iron, FBE coating and lining	

1.3.2 DN200 (Manual)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.3.1.1	Manufacturer			
1.3.1.2	Data Sheet attached?		Yes	
1.3.1.3	Valve diameter	mm	150	
1.3.1.4	Operation		Manual	
1.3.1.5	Liquid		Water (clarifier sludge and clear water)	
1.3.1.6	Actuation/Control		Handwheel, clockwise close	
1.3.1.7	Connection		Flanged	
1.3.1.8	Pressure Class		PN10	
1.3.1.9	Spindle Length		Standard	
1.3.1.10	Material		Cast Iron, FBE coating and lining	

TECHNICAL DATA SHEET NO. 1.4

Butterfly Valves

1.4.1 DN80 (Manual)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.4.1.1	Manufacturer			
1.4.1.2	Data Sheet attached?		Yes	
1.4.1.3	Valve diameter	mm	80	
1.4.1.4	Operation		Manual	
1.4.1.5	Liquid		Raw and treated water	
1.4.1.6	Actuation/Control		Quarter-turn	
1.4.1.7	Connection		Wafer	
1.4.1.8	Communication protocol		None	
1.4.1.9	Pressure Class		PN10	
1.4.1.10	Spindle Length		Standard	
1.4.1.11	Material		Cast Iron, FBE coating and lining	

1.4.2 DN100 (Manual)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.4.2.1	Manufacturer			
1.4.2.2	Data Sheet attached?		Yes	
1.4.2.3	Valve diameter	mm	100	
1.4.2.4	Operation		Manual	
1.4.2.5	Liquid		Raw and treated water	
1.4.2.6	Actuation/Control		Quarter-turn	
1.4.2.7	Connection		Wafer	
1.4.2.8	Communication protocol		None	
1.4.2.9	Pressure Class		PN10	
1.4.2.10	Spindle Length		Standard	
1.4.2.11	Material		Cast Iron, FBE coating and lining	

1.4.3 DN150 (Manual)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.4.3.1	Manufacturer			
1.4.3.2	Data Sheet attached?		Yes	
1.4.3.3	Valve diameter	mm	150	
1.4.3.4	Operation		Manual	
1.4.3.5	Liquid		Raw and treated water	
1.4.3.6	Actuation/Control		Quarter-turn	
1.4.3.7	Connection		Wafer	
1.4.3.8	Communication protocol		None	
1.4.3.9	Pressure Class		PN10	
1.4.3.10	Spindle Length		Standard	
1.4.3.11	Material		Cast Iron, FBE coating and lining	

1.4.4 DN200 (Manual)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.4.3.1	Manufacturer			
1.4.3.2	Data Sheet attached?		Yes	
1.4.3.3	Valve diameter	mm	200	
1.4.3.4	Operation		Manual	
1.4.3.5	Liquid		Raw and treated water	
1.4.3.6	Actuation/Control		Handwheel, clockwise close	
1.4.3.7	Connection		Flanged	
1.4.3.8	Communication protocol		None	

1.4.3.9	Pressure Class		PN10	
1.4.3.10	Spindle Length		Standard	
1.4.3.11	Material		Cast Iron, FBE coating and lining	

1.4.5 DN300 (Manual)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.4.3.1	Manufacturer			
1.4.3.2	Data Sheet attached?		Yes	
1.4.3.3	Valve diameter	mm	300	
1.4.3.4	Operation		Manual	
1.4.3.5	Liquid		Raw and treated water	
1.4.3.6	Actuation/Control		Handwheel, clockwise close	
1.4.3.7	Connection		Flanged	
1.4.3.8	Communication protocol		None	
1.4.3.9	Pressure Class		PN10	
1.4.3.10	Spindle Length		Standard	
1.4.3.11	Material		Cast Iron, FBE coating and lining	

1.4.6 DN400 (Manual)

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.4.3.1	Manufacturer			
1.4.3.2	Data Sheet attached?		Yes	
1.4.3.3	Valve diameter	mm	400	
1.4.3.4	Operation		Manual	
1.4.3.5	Liquid		Raw and treated water	
1.4.3.6	Actuation/Control		Handwheel, clockwise close	
1.4.3.7	Connection		Flanged	
1.4.3.8	Communication protocol		None	
1.4.3.9	Pressure Class		PN10	
1.4.3.10	Spindle Length		Standard	
1.4.3.11	Material		Cast Iron, FBE coating and lining	

TECHNICAL DATA SHEET NO. **1.50**

Check Valves

1.5.1 DN150

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.5.1.1	Manufacturer			
1.5.1.2	Data Sheet attached?		Yes	
1.5.1.3	Valve diameter	mm	150	
1.5.1.2	Type		Swing check valve with lever arm and limit switch for no-flow protection of pump	
1.5.1.3	Connection		Flanged	
1.5.1.4	Pressure Class		PN10	
1.5.1.3	Material		Cast Iron, FBE coating and lining	

1.5.2 DN300

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.5.1.1	Manufacturer			
1.5.1.2	Data Sheet attached?		Yes	
1.5.1.3	Valve diameter	mm	300	
1.5.1.2	Type		Swing check valve with lever arm and limit switch for no-flow protection of pump	
1.5.1.3	Connection		Flanged	
1.5.1.4	Pressure Class		PN10	
1.5.1.3	Material		Cast Iron, FBE coating and lining	

TECHNICAL DATA SHEET NO. **1.60**

Instrumentation - Sensors

1.6.1 Turbidity Meter

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.6.1.1	Manufacturer			
1.6.1.2	Data Sheet attached?		Yes	
1.6.1.3	NTU Range		0 - 30	
1.6.1.4	Liquid		Potable water	
1.6.1.5	Local Display		No	
1.6.1.6	Communication Protocol		Modbus	
1.6.1.7	Environmental Protection		IP68	
1.6.1.8	Units		NTU	

TECHNICAL DATA SHEET NO. **1.7**

Air Release Valves

1.7.1 DN50

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.7.1.1	Manufacturer			
1.7.1.2	Data Sheet attached?		Yes	
1.7.1.3	Diameter (Nominal Bore)	mm	50	
1.7.1.4	Liquid		Raw Water and treated water	
1.7.1.5	Actuation/Control		Automatic with anti-slam orifice	
1.7.1.6	Communication protocol		None	
1.7.1.7	Connection		Flanged	
1.7.1.8	Spindle length		Standard	
1.7.1.9	Material		Ductile Iron, FBE coating and lining body, Top Plate: Stainless Steel, Automatic Orifice: Stainless Steel, Float Assembly: Polypropylene, Elastomers: EPDM	
1.7.1.10	Pressure class		PN10	

1.7.2 **DN100**

ITEM	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1.7.1.1	Manufacturer			
1.7.1.2	Data Sheet attached?		Yes	
1.7.1.3	Diameter (Nominal Bore)	mm	100	
1.7.1.4	Liquid		Raw Water and treated water	
1.7.1.5	Actuation/Control		Automatic with anti-slam orifice	
1.7.1.6	Communication protocol		None	
1.7.1.7	Connection		Flanged	
1.7.1.8	Spindle length		Standard	
1.7.1.9	Material		Ductile Iron, FBE coating and lining body, Top Plate: Stainless Steel, Automatic Orifice: Stainless Steel, Float Assembly: Polypropylene, Elastomers: EPDM	
1.7.1.10	Pressure class		PN10	

TECHNICAL DATA SHEETS FOR ELECTRICAL, CONTROL AND INSTRUMENTATION EQUIPMENT

ALL DATA SHEETS TO BE COMPLETED WITH SUBMISSION

PART A – ELECTRICAL, CONTROL AND INSTRUMENTATION

1. MEDIUM VOLTAGE – N/A

2. LOW VOLTAGE

2.1. MOTOR CONTROL CENTRES (MCCs)

1. MCC dimensions (l x w x h), height to include stand height

1.1. New Filter Feed PS MCC: .....

2. Will MCCs be in compliance to SANS 1973-3? ..... YES / NO

3. State method of compliance .....

4. Name of steelwork/busbar manufacturer .....

5. Name and address of populator .....

5.1. If different entities in 4 and 5, confirm that all work carried out by 1.5 will comply strictly with the required OHS Act requirements (Note: this is a statement of legal compliance) .....YES / NO

6. Variable Frequency Controllers

6.1. Manufacturer and Model Number .....

2.2. INSTRUMENTATION

2.2.1. **Ultrasonic Level Sensor and Controller**

1. Manufacturer .....

2. Place of manufacture .....

3. Sensor model number .....

4. Controller model number .....

5. Accuracy .....

2.2.2. **Float Level Switches**

1. Manufacturer .....

2. Place of manufacture .....

3. Model number description .....

4. Operating voltage .....

2.2.3. **Electro-Magnetic Flow Meter**

1. Manufacturer .....

2. Place of manufacture .....

3. Meter model number .....

4. Accuracy .....

5. Device provided with network communication? .....YES / NO

6. Lining suited to specific applications? ..... YES / NO

2.2.4. **Pressure Sensors**

1. Manufacturer .....

2. Place of manufacture .....

3. Sensor model number .....

4. Measuring range .....

5. Accuracy .....

2.3. CABLES

2.3.1. **Power**

1. Manufacturer .....

2. Type .....

2.3.2. **Control**

1. Manufacturer .....

2. Type .....

2.3.3. **Instrumentation**

1. Manufacturer .....

2. Type .....

2.3.4. **Network (Copper)**

1. Manufacturer .....

2. Type .....

3. CONTROL SYSTEM INTEGRATION

3.1. **SYSTEM INTGRATOR**

1. Company (Name) .....

2. Details

2.1. Years' Experience .....

2.2. Number of successfully completed industrial automation projects .....

2.3. Company Western Cape based? .....YES / NO

3.2. **PLC**

1. Manufacturer (Name) .....

2. Model and Series .....

3.3. **UPS**

1. Manufacturer (Name) .....

2. Series Model .....

3. Rating KVA .....

3.4. **HMI**

1. Manufacturer (Name) .....

2. Series Model and size .....

3. Other technical detail .....

.....

3.5. **NETWORK SWITCHES**

1. Manufacturer (Name) .....

2. Series Model .....

3. Managed type? .....YES / NO

4. Other technical detail .....

Schedule 27:Schedule of Imported Equipment

VALUES OF IMPORTED EQUIPMENT as per Item 8 of C2.1: Pricing Assumptions					CUSTOMS DUTY		SURCHARGE		Total in Rand of (C) + (D) + (E) included in Bill of Quantities Item
Bill of Quantities Item	Description of Equipment	Value in Foreign Currency (A)	Rate of Exchange (B)	Value in Rand (A) X (B) (C)	%	Rand (D)	%	Rand (E)	(F)

Part C1: Agreements and Contract Data

PART C1: AGREEMENTS AND CONTRACT DATA 91

C1.1 FORM OF OFFER AND ACCEPTANCE 92
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C1.4 OCCUPATIONAL HEALTH AND SAFETY AGREEMENT 114
C1.5 PRO FORMA FORM OF ADVANCE PAYMENT GUARANTEE 116
C1.6 INSURANCE BROKER'S WARRANTY 118

C1.1 Form of Offer and Acceptance

Offer

The employer, identified in the acceptance signature block, has solicited offers to enter into a contract for the procurement of:

TENDER NO. 13/2026: UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1

The tenderer, identified in the offer signature block, has examined the documents listed in the tender data and addenda thereto as listed in the returnable schedules, and by submitting this offer has accepted the conditions of tender.

By the representative of the tenderer, deemed to be duly authorized, signing this part of this form of offer and acceptance, the tenderer offers to perform all of the obligations and liabilities of the contractor under the contract including compliance with all its terms and conditions according to their true intent and meaning for an amount to be determined in accordance with the conditions of contract identified in the contract data.

THE OFFERED TOTAL OF THE PRICES INCLUSIVE OF VALUE ADDED TAX IS:

Rand……

……(in words);

R……(in figures)

This offer may be accepted by the employer by signing the acceptance part of this *Form of Offer and Acceptance* and returning one copy of this document to the tenderer before the end of the period of validity stated in the tender data, whereupon the tenderer becomes the party named as the contractor in the conditions of contract identified in the contract data.

Signature(s): …… ……

Name(s): …… ……

Capacity: …… ……

Name of organization/tenderer: ……

Address of organization/tenderer: ……

……

Name and signature of witness: ……Date: ……

For official use.		
INITIALS OF MUN. OFFICIALS AT TENDER OPENING		
1.	**2.**	**3.**

Acceptance

By signing this part of this form of offer and acceptance, the employer identified below accepts the tenderer's offer. In consideration thereof, the employer shall pay the contractor the amount due in accordance with the conditions of contract identified in the contract data. Acceptance of the tenderer's offer shall form an agreement between the employer and the tenderer upon the terms and conditions contained in this agreement and in the contract that is the subject of this agreement.

The terms of the contract are contained in:

Part C1: Agreements and contract data (which includes this agreement)
Part C2: Pricing data
Part C3: Scope of work
Part C4: Site information

and drawings and documents or parts thereof, which may be incorporated by reference into the above listed Parts.

Deviations from and amendments to the documents listed in the tender data and any addenda thereto as listed in the returnable schedules as well as any changes to the terms of the offer agreed by the tenderer and the employer during this process of offer and acceptance, are contained in the schedule of deviations attached to and forming part of this form of offer and acceptance. No amendments to or deviations from said documents are valid unless contained in this schedule.

The tenderer shall within two weeks after receiving a completed copy of this agreement, including the schedule of deviations (if any), contact the employer's agent (whose details are given in the contract data) to arrange the delivery of any securities, bonds, guarantees, proof of insurance and any other documents to be provided in terms of the conditions of contract identified in the contract data. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

CONTRACT TO BE COMPLETED AT ACCEPTANCE STAGE

Notwithstanding anything contained herein, this agreement comes into effect on the date when the parties have signed the table below and confirms receipt from the employer of one fully completed original copy of this agreement, including the schedule of deviations (if any). The tenderer (now contractor**)** shall within five working days of the agreement coming into effect notify the employer in writing of any reason why he cannot accept the contents of this agreement as a complete and accurate memorandum thereof, failing which the agreement presented to the contractor shall constitute the binding contract between the parties.

Business Name		
Business Registration		
Tax number (VAT)		
Physical Address		
Accepted contract sum (incl. tax)		
Accepted contract duration		
Signed (who by signature hereto warrants authority)		
Name of signatory		
Signed: Date		
Signed: Location		
Signed: Witness		
Name of Witness		

Schedule of Deviations

Notes:

1. The extent of deviations from the tender documents issued by the employer before the tender closing date is limited to those permitted in terms of the conditions of tender.
2. A tenderer's covering letter shall not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid, become the subject of agreements reached during the process of offer and acceptance, the outcome of such agreement shall be recorded here.
3. Any other matter arising from the process of offer and acceptance either as a confirmation, clarification or change to the tender documents and which it is agreed by the Parties becomes an obligation of the contract shall also be recorded here.
4. Any change or addition to the tender documents arising from the above agreements and recorded here, shall also be incorporated into the final draft of the Contract.

1 Subject . . . . . .

Details . . . . . .

. . . . . .

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2 Subject . . . . . .

Details . . . . . .

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3 Subject . . . . . .

Details . . . . . .

. . . . . .

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. . . . . .

4 Subject . . . . . .

Details . . . . . .

. . . . . .

. . . . . .

. . . . . .

ONLY TO BE COMPLETED AT ACCEPTANCE STAGE

By the duly authorised representatives signing this agreement, the employer and the tenderer agree to and accept the foregoing schedule of deviations as the only deviations from and amendments to the documents listed in the tender data and addenda thereto as listed in the returnable schedules, as well as any confirmation, clarification or changes to the terms of the offer agreed by the tenderer and the employer during this process of offer and acceptance.

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender documents and the receipt by the tenderer of a completed signed copy of this Agreement shall have any meaning or effect in the contract between the parties arising from this agreement.

C1.2 Contract Data

Part 1: Contract Data Provided by the Employer

General Conditions of Contract

The following standardized General Conditions of Contract:

The Conditions of Contract comprise the "General Conditions", which form part of the "Conditions of Contract for Construction for Building and Engineering Works designed by the Employer", Second Edition 2017 (reprinted 2022 with amendments) as published by the FIDIC, document ISBN 978-2-88432-084-9, the "Contract Data" (Particular Conditions - Part A) and the following "Special Provisions" (Particular Conditions – Part B), which includes amendments and additions to such General Conditions.

The provisions to be found in the Special Provisions (Particular Conditions – Part B) take precedence over the equivalent provisions found under the same Sub-Clause number(s) in the General Conditions, and the provisions of the Contract Data (Particular Conditions – Part A) take precedence over the Special Provisions (Particular Conditions – Part B).

Copies of these conditions of contract may be obtained from the CESA Tel no: (0)11 463 2023 at the Contracting Party's own account.

CONTRACT DATA (PARTICULAR CONDITIONS - PART A)

The following contract specific data, referring to the General Conditions, are applicable to this Contract:

Sub-Clause	Data to be given	Data
1.1.20	Where the contract allows for Cost Plus Profit, percentage Profit to be added to the Cost	As stated under 12.3 below
1.1.27	Defects Notification Period (DNP)	365 days
1.1.31	Employer's name and address	LANGEBERG MUNICIPALITY Address (physical): 28 Main Road Ashton 6715 Postal address: PRIVATE BAG X2 ASHTON 6715 DP Lubbe (Municipal Manager)
1.1.35	Engineer's name and address	Neil Lyners and Associates (Pty) Ltd Address (Physical): South Gate Building Ground Floor Carl Cronje Drive Tyger Valley Waterfront BELLVILLE 7530 Address (Postal): PO Box 4901 Tygervalley 7536 Name: Ms Monique Lyners
1.1.84	Time for Completion	250 Days
1.3(a)(ii)	Agreed method of electronic transmission	Electronic Mail (E-mail)
1.3(d)	Address of Employer for communications	Mr DP Lubbe Telephone: +27 (23) 615 8000 Email: mm@langeberg.gov.za
1.3(d)	Address of Engineer for communications	Name: Ms Monique Lyners Telephone: +27 021 914 0300 Email: monique@lyners.co.za
1.4	Governing Law	Law of the Republic of South Africa
1.4	Ruling Language	English
1.4	Language for communications	English
1.8	Number of additional paper copies of Contractor's documents	None
1.15	Total liability of the Contractor to the Employer under or in connection with the Contract	The Accepted Contract Amount.
2.1	After receiving the Letter of Acceptance, the Contractor shall be given right of access to, and possession of, part of the site only for Site Establishment (erection of the site camp):	On Notice of Commencement of Works
2.4	Employer's financial arrangement	Clause deleted

Sub-Clause	Data to be given	Data
4.2	Performance Security	10% if the Accepted Contract Amount, in the currencies stated in Sub-Clause 14.15.
4.7.2(a)	Period for notification of errors in the items of reference	14 days
4.19	Period of payment for temporary utilities	Monthly
4.20	Number of additional paper copies of progress reports	7 copies
5.1(a)	Maximum allowable accumulated value of work subcontracted (as a percentage of the Accepted Contract Amount)	50%
5.1(b)	Parts of the Works for which subcontracting is not permitted	None
6.5	Normal working hours	Normal working hours shall be those as stated in the applicable Sectoral Determination applicable to a 5 (five) day week (Monday to Friday) from 07:00 to 17:00.
8.2	Time for Completion including the 28 day Trial Operation Period	250 days
8.3	Number of additional paper copies of programmes	None
8.8	Delay damages payable for each day of delay	The penalty for failing to complete the Works is R 5 000.00 per calendar day.
8.8	Maximum amount of delay damages	15% of the Accepted Contract Amount as stated in the Contract Agreement
11.10	Duration of liability for Latent Defects	• Civil Engineering Work including structures: 10 years • Building Work: 10 years • Mechanical Engineering Work: 5 years • Electrical and Electronic Engineering Work: 3 years
12.2	Method of measurement	As stated in the Pricing Assumptions and Payment Descriptions as stated in the Scope of Works.
12.3	Percentage profit	5%
13.4(b)(ii)	Percentage rate to be applied to Provisional Sums for overhead charges and profit:	Percentage as tendered in the Schedule of Rates and Price
14.2	Total amount of Advance Payment	None / Not applicable
14.3	Period of payment	Monthly
14.3(b)	Number of additional paper copies of Statements	None
14.3(iii)	Percentage of retention	10% of the final construction value, reducing to 5% upon issue of the Taking-Over Certificate for the overall works or portion of the works (if applicable)
14.3(iii)	Limit of retention money	10% of Accepted Contract Amount
14.5(b)	Plant and Materials for payment when shipped en-route to the Site	Not Applicable
14.5(c)(i)	Plant and Materials for payment when delivered to the Site	Refer to Part C2.2 Bill of Quantities
14.6.2	Minimum amount of Interim Payment Certificates	Not applicable

Sub-Clause	Data to be given	Data
14.7(a)	Period of payment of Advance Payment to the Contractor	Not Applicable
14.7(b)(i)	Period for the Employer to make interim payments to the Contractor under Clause 14.6 (Interim Payments)	30 days after the Employer receives the IPC and invoice
14.7(b)(ii)	Period for the Employer to make interim payments to the Contractor under Clause 14.13 (Final Payment)	30 days after the Employer receives the IPC and invoice
14.7(c)	Period for the Employer to make final payment to the Contractor	30 days after the Employer receives the FPC and invoice
14.8	Financing charges for delayed payment (percentage points above average bank short term lending rate as referred to under sub-paragraph (a))	2%
14.11.1(b)	Number of additional paper copies of draft Final Statement	None
14.15	Currencies for payment of Contract Price	South African Rand
17.2(d)	Forces of nature, the risks of which are allocated to the Contractor	Rainfall, flooding or other climatic events with a recurrence interval of less than once in 10 years
19.1	Permitted deductible limit	R 25 000.00 or to be approved by Employer
19.2.1(b)	Additional amount to be insured (as a percentage of the replacement value)	25%
19.2.1(iv)	List of Exceptional Risks which shall not be excluded from the insurance cover for the Works	None
19.2.2	Extent of insurance required for Goods and the amount of insurance required for Goods	Full replacement value including delivery to Site
19.2.3(a)	Amount of insurance required for liability for breach of professional duty	Accepted Contract Amount as stated in the Contract Agreement plus 25%
19.2.3(b)	Insurance required against liability for fitness for purpose.	Yes
19.2.3	period of insurance required for liability for breach of professional duty	The insurance shall be maintained after the date of the Performance Certificate for the period(s) stated in Sub-Clause 11.10 above.
19.2.4	amount of insurance required for injury to persons and damage to property (third party insurance)	R 20 000 000.00
19.2.6	Other insurances required by Laws and Local Practise	SASRIA to the value of the Accepted Contract Amount as stated in the Contract Agreement plus 25%
21.1	The DAAB shall comprise:	One (1) sole member
21.1	List of proposed members of DAAB	1. ……. 2. ……. 3. ……..

SPECIAL PROVISIONS (PARTICULAR CONDITIONS - PART B)

Clause	Description
1.1	**DEFINITIONS**
1.1.10	**Is deleted and replaced by:** "Contract" means the Form of Offer and Acceptance, Contract Data, these Conditions, the Specifications, the Drawings, the Schedules, the JV Undertaking (if applicable) and the further documents (if any), which are listed in the Form of Offer and Acceptance, and further includes drawings and documents or parts thereof, which any of the aforesaid documents incorporate by reference.
1.1.11	**Is deleted and replaced by:** "Contract Agreement" means the agreement entered into by both Parties by signing the document called "Form of Offer and Acceptance" in accordance with Sub-Clause 1.6.
1.1.50	**Is deleted and replaced by:** "Letter of Acceptance" means that section of the Form of Offer and Acceptance called "Acceptance".
1.1.51	**Is deleted and replaced by:** "Letter of Tender" means that section of the Form of Offer and Acceptance called "Offer|".
1.1.63	**Is deleted and replaced by:** "Performance Security" means the security (or securities, if any) under Sub-Clause 4.2 provided in terms of the Form of Guarantee contained in C1.3.
1.1.76	**Is deleted and replaced by:** "Specification" means that document entitled "Scope of Work", as included the Contract, and any additions and modifications to the Scope of Work in accordance with the Contract. Such document specifies the Works.
1.1.71	**Is deleted and replaced by:** "Schedules" means the document(s) entitled Tender Schedules, completed by the Contractor and submitted with his tender offer, as included in the Contract. Such document(s) may include the Bill of Quantities, data, lists and schedules of rates and / or prices.
1.1.81	**Is deleted and replaced by:** "Tender" means that section of the Form of Offer and Acceptance called "Offer" and all other documents which the Contractor submitted as Returnable Documents, as included in the Contract.
1.1.89	**Add the following new definition:** "Critical Path means the sequence of work tasks that determines the minimum "Time for Completion" needed to complete the "Works" as described in the "Scope of Works"."
1.1.90	**Add the following new definition: "**Contractual Documentation Period" means the period (number of non-working days) from the Letter of Acceptance until the Commencement Date. The period shall be determined by the greater of, as specified in Sub-Clauses 2.1 and 2.2: a) number of days required within which the Contractor must submit acceptable documentation and obtain approval thereof from the Employer b) or the number of days required by the Employer to obtain the Construction Work Permit and number."
1.1.91	**Add the following new definition: "**Health and Safety manual" means Health and Safety file".
1.5	**PRIORITY OF DOCUMENTS** **Delete the list (a) to (k) and replaced with :** **"** a) the Form of Offer and Acceptance; b) Contract Data: Data provided by the Employer; c) Contract Data: Data provided by the Contractor; d) the Particular Conditions – Part A – Contract Data; e) the Particular Conditions – Part B – Special Provisions; f) the General Conditions of Contract; g) the Project Specifications h) the Project Drawings; i) the Standard Drawings; j) the Standard Specification; k) the Schedules"

Clause	Description
1.13	**COMPLIANCE WITH LAWS** **Add the following after the last paragraph:** "The Contractor shall inter alia comply with: a) The Basic Conditions of Employment Act, 1997 (Act No 75 of 1997), as per Government Notice R63 of 25 January 2022 b) The Compensation for Occupational Injuries and Diseases Act, 1993 (Act 130 of 1993) c) National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) d) Occupational Health and Safety Act, 1993 (Act 85 of 1993) e) Section 37(2) Mandatory agreement between Employer and Contractor f) Construction Regulations 2014 g) Site Specific Health and Safety Specification and Baseline Risk assessment prepared by the Employer in terms of the Construction Regulations 2014. h) Environmental Management Program (if applicable)" i) CIDB build programme CSDG requirements as published in Government Gazette No. 48491 of 28 April 2023
1.13.1	**Add sub-clause 1.13.1** **"1.13.1 CONTRACTOR TO NOTIFY THE EMPLOYER** The Employer retains an interest in all enquiries conducted under this Contract in terms of Section 31 and /or 32 of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and its Regulations following any incident involving the Contractor and/or sub-Contractor and/or their employees. The Contractor shall notify the Employer in writing of all investigations, complaints or criminal charges which may arise pursuant to the work performed under this Contract in terms of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)."
2.1	**RIGHT OF ACCESS TO SITE** **Delete the first two paragraphs and add the following wording at the top of the Sub-clause:** "Access to and possession of the Site shall not be exclusive to the Contractor. Access to Site shall only be granted after the completion of the Contractual Documentation Period in which a) the draft and final contractual documentation (as listed below) is submitted by the Contractor and approved by the Engineer and Employer b) and the Employer is in possession of the Construction Regulations 2014 (regulation 3) construction work permit and number (if applicable). The following documentation shall be submitted within 14 days after the Contractor's receipt of the Letter of Acceptance: a) Health and Safety Plan (Refer to Clause 4.8) b) Signed agreement in terms of the provisions of Section 37(2) of the Occupational Health and Safety Act (No. 85 of 1993) and the Construction Regulations promulgated thereunder. c) Programme (Refer to Clause 8.3) and cash flow d) Draft Performance Security (Refer to Clause 4.2) e) Insurance (Refer to Clause 19.2) f) Letter of Good Standing from the Workmen Compensation Fund (UIF) (if not insured with a Licensed Compensation Insurer) g) Letter of Good Standing with the Bargaining Council for the Civil Engineering Industry (BCCEI) h) CV's and Qualifications of key personnel, or confirmation of the personnel as offered remains unchanged i) Risk register The Contractor shall cooperate and amend the documentation to obtain the Employer and Engineer's approval within 28 days of the Contractor's receipt of the Letter of Acceptance. The Contractor shall allow a minimum of 28 non-working days for the Contractual Documentation Period in the Programme for Access to Site be granted.

Clause	Description
	The Contractor shall upon approval of the requirements stated above and compliance with Sub-clause 4.2 be granted access to establish site (site camp). Upon 100% completion of the site camp to the satisfaction of the Engineer, access to and possession to the remainder of the site will be granted. The Contractor shall bear all costs and charges for special and temporary rights of way required by him in connection with access to the site. The Contractor shall also provide at his own cost any additional facilities outside the site required by him for the purpose of the works."
2.2	**ASSISTANCE** **Add the following wording at the end of the clause:** (c) The Employer's Occupational Health and Safety Agent shall submit the approved Contractors Health and Safety Plan with its application to the Provincial Director for obtaining the Construction Regulations 2014 construction work permit and number. The Contractor may not commence with construction work on site (including the erection of the site camp) until the Employer is in possession of the Construction Regulations 2014 (regulation 3) construction work permit and number.
3.2	**ENGINEER'S DUTIES AND AUTHORITY** **Add the following wording to the third paragraph:** "The Engineer shall obtain the specific approval of the employer before taking action under the following sub-clauses of these conditions: 3.4 Delegation by the Engineer 3.6 Replacement of the Engineer 6.5 Normal Working Hours 8.8 Reduction of penalty for delay (Delay Damages) 10.2 The issue of a Taking Over Certificate 11.9 The issue of a Performance Certificate 13.3 Any variation order or the use of contingencies 13.4 Instruction to expend on provisional sums 20 Approval of claims"
3.4	**DELEGATION BY THE ENGINEER** **Add the following wording after the last paragraph:** "The engineer's assistant shall have the following delegated authority: (i) to approve/reject any part of the project; (ii) to perform inspections on behalf of the engineer; (iii) to issue site instructions on behalf of the engineer; (iv) to instruct the contractor to do any test that is deemed necessary; (v) to issue fault lists on behalf of the engineer; (vi) as listed in a specific letter of delegation."
3.5	**ENGINEER'S INSTRUCTIONS** **Add the following wording to the end of the second paragraph:** **"**Oral instructions shall not constitute a valid instruction, and all instructions shall be reduced to writing."
4.2	**PERFORMANCE SECURITY**
4.2.1	**CONTRACTOR'S OBLIGATIONS** **Delete the first paragraph and replace with:** "The Contractor shall deliver the draft Performance Security in electronic format to the Employer for approval with a copy to the Engineer, within 14 days after receiving the Letter of Acceptance. Once the Employer approves the draft Performance Security, the Contractor shall deliver a hard copy and originally sign Performance Security within 7 days to the Employer and an electronic copy of the signed document to the Engineer.

Clause	Description
	The performance guarantee shall be issued by a Bank or Insurance Company approved by the Employer. Guarantees submitted must be issued by either an insurance company duly registered in terms of the Short-Term Insurance Act, 1998 (Act 35 of 1998) or by a bank duly registered in terms of the Banks Act, 1990 (Act 94 of 1990) on the pro forma attached to the Contract Data. No alterations or amendments of the wording of the pro forma will be accepted."
4.3	**CONTRACTOR'S REPRESENTATIVE**
	Add the following wording to the end of the first paragraph:
	"The Contractor's Representative shall be the person identified in the Contract's Returnable Schedules and Part 2 – Data provided by the Contractor as the Contractor's Representative / Contracts Manager. The Contractor may not substitute any personnel originally offered or subsequently approved throughout the Contract period without the approval of the Engineer and the Employer. If the Contractor wishes to replace or substitute a person, the person replacing the said person shall be of equal experience and qualification or higher."
	Delete the seventh (second last) paragraph and replace with:
	The Contractor's Representative may, with consent from the Employer and Engineer delegate any powers, functions and authority except:
	(a) the authority to issue and receive Notices and other communications under Sub-Clause 1.3 [*Notices and Other Communications*]; and
	(b) the authority to receive instructions under Sub-Clause 3.5 [Engineer's Instructions]),
	to any suitably competent and experienced person and may at any time revoke the delegation. Any delegation or revocation shall not take effect until the Engineer has given consent after consultation with the Employer after he received a Notice from the Contractor's Representative, naming the person, specifying the powers, functions and authority being delegated or revoked, and stating the timing of the delegation or revocation."
4.7.2	**ERRORS**
	Delete the wording of sub-paragraph (b) and replace with:
	"(b) as soon as practicable after receiving the items of reference, if they are issued by the Engineer under Sub-Clause 2.5 [Site data and Items of Reference], but not later than 14 days after the date it was issued."
4.8	**HEALTH AND SAFETY OBLIGATIONS**
	Delete the second paragraph and replace with:
	"Within 14 days of the Contractor's receipt of the Letter of Acceptance and before commencing any construction work on Site, the Contractor shall submit to the Engineer for review a health and safety plan which has been specifically prepared for the Works, the Site and other places (if any) where the Contractor intends to execute the Works. This manual shall be in addition to any other similar document required under the applicable health and safety regulations and laws."
	Add the following sub-clause:
4.18.1	**"4.18.1 SEWAGE SPILLAGE AND INTERRUPTION OF THE EXISTING WORKS**
	The Contractor shall be subjected to a fine for each sewage spill or interruption of operation of the existing works cause by the contractor (or any of the sub-contractors). The Contractor shall also be liable for any and all claims against the Employer arising from the spill or interruption of the operation.
	Sewage discharged through any overflow pipes shall also be deemed as a spill and will be fined. Interruption of the existing works may include the prevention of sewage to enter the waste water treatment works due to actions of the Contractor, causing pump blockages due to debris passing any temporary screens, etc that may reduce the operation of the existing works.
	The fine for a spill or interruption of the existing works shall be applicable to every event and the fine shall be R 10 000.00 (excluding VAT) for the first 12 hours (or any part of it), then an additional R 1 500.00 per hour (or any part thereof) until the event is stopped. The Contractor shall also be liable for any cost associated with the repair and / or correction required to stop the event (including all labour, material and plant required), all costs associated with the clean-up of the affected area(s) as well as any and all costs associated with claims against the Employer arising from the spill or interruption. All contaminated ground shall be removed from site and discharge according to the Municipal bylaws.

Clause	Description
	The Contractor shall submit a detailed report within 24 hours of the end of the event to the Engineer, stipulating the cause of the event, the resultant damage and corrective action taken. Should the Contractor not submit this report within the stipulated time, a separate fine of R2000.00 (excluding VAT) shall be enforced."
4.20	**PROGRESS REPORTS** **Delete the first paragraph and replace with:** "The Contractor shall prepare monthly progress reports and shall submit an electronic copy to the Engineer and Employer. The first report shall cover the period up to the 48 hours before the first Site Meeting following the Commencement Date. Reports shall be submitted monthly thereafter within 2 days after the period to which it relates. The Contractor shall submit a comprehensive progress report at least 48 hours prior to the monthly site meetings."
4.24	**Add the following sub-clause:** **"4.24 CONTRACTOR'S SUPERINTENDENCE** The Contractor shall provide all necessary superintendence while carrying out the Works. The Contractor's appointed Health and Safety Officer, Construction Manager and General Foreman shall be on site at all times when work is being performed. Notwithstanding the requirements of this Clause, the Contractors appointed Construction Manager, Foreman and Health and Safety Officer shall be solely dedicated to this Contract. The Contractor or a competent and authorised agent or representative approved of in writing by the Engineer (which approval may at any time be withdrawn in writing), hereinafter called the Construction Manager, shall be on the Site at all times when work is being performed or when the Engineer shall, within reason, require his presence. The Construction Manager shall not have authority to receive, on behalf of the Contractor, any oral or written communications from the Engineer or the Engineer's Assistant / Representative or other person authorised by the instructions Engineer in terms of Sub-Clause 3.5"
6.5	**NORMAL WORKING HOURS** **Add the following wording at the end:** "Non-working days are Saturdays and Sundays. <u>Special non-working days are:</u> • Any statutory public holiday in terms of the Public Holidays Act, and, where such statutory public holiday falls on a Sunday, and the next Monday subsequently becomes a statutory public holiday in terms of the Public Holidays Act, then both the relevant Sunday and the relevant Monday shall be special non-working days under the contract, • Any proclaimed statutory election day which is proclaimed as a statutory public holiday and any proclaimed statutory day of mourning. • All annual year-end shutdown periods as recommended by the South African Forum of Civil Engineering Contractors (SAFCEC), up to a maximum of 15 working days (excluding special non-working days) per annual year-end shutdown period. • The days from the Engineer's approval or deemed approval of the documentation stated in Sub-Clause 2.1 until the Notice for Commencement of Work, confirming receipt of the Construction Regulations 2014 (regulation 3) construction work permit and number (if applicable). Should the Contractor wish to work outside of the normal working hours to conduct or complete a certain task, approval from the Engineer must be obtained at least 7 days in advance. The cost of supervision by the Engineer or his/her Representative outside of normal working hours (Monday to Friday) in accordance with this Clause shall be to the Contractors account."

Clause	Description
7.7	**OWNERSHIP OF PLANT AND MATERIALS** **Add the following at the end of the sub-clause:** "Notwithstanding points (a) and (b) above, the Contractor shall remain responsible for Plant and Materials that falls within the Scope of Works. The Contractor shall protect the Plant and Materials against theft, damage, vandalism and unreasonable wear and tear whether the Plant and Materials are stored on-site, off-site or installed (not yet commissioned) at no additional cost to the Employer other than stipulated under General Requirements and Conditions until final commissioning and handover. Insurance by the Contractor of this Plant and Material against these risks is also required to be included under Sub-Clause 19.2."
8.1	**COMMENCEMENT OF WORKS** **Delete the first paragraph and replace it with:** "The Engineer shall give Notice to the Contractor stating the Commencement Date, not less than 7 days before the Commencement Date. The Engineer may not issue the Notice, and therefore the Contractor may not commence with construction work on site (including the erection of the site camp), until the Employer is a) in possession of the Construction Regulations 2014 (regulation 3) Construction Work Permit and Number (if applicable), and b) all the final contractual documentation, as listed in Sub-clause 2.1, is approved and in place. The Employer's Occupational Health and Safety Agent shall submit the approved Contractors Health and Safety Plan with its application to the Provincial Director for obtaining the Construction Regulations 2014 construction work permit and number (if applicable). Commencement of the Works shall not be deemed to take place until a construction work permit (if required) has been issued by the Provincial Director in terms of Clause 1.13 [Compliance with Laws]. The Contractual Documentation Period (provisionally 56 days) may be extended should the approval of the contractual documentation or the obtaining of the construction work permit is delayed"
8.2	**TIME FOR COMPLETION** **Add the following word at the end of the first paragraph:** "The time for completion shall include all working and non-working days as defined in Sub-clause 6.5 as well as achieving the passing of the Tests on Completion and the 28 day trial operation Period referred to in Clause 9.1."
8.3	**PROGRAMME** **Delete the first sentence and replace with:** "The Contractor shall submit an initial programme for the execution of the Works to the Engineer within 14 days after receiving Letter of Acceptance." **Add the following after point (k)** (m) Health and Safety requirements such as but not limited to Construction Work Permit, health and safety plan, medicals, inductions etc. indicated as milestone items.
8.5	**EXTENSION OF TIME FOR COMPLETION** **Add the following sub-clause:**
8.5.1	**"8.5.1 EXTENSION OF TIME FOR COMPLETION DUE TO EXCEPTIONALLY ADVERSE CLIMATIC CONDITIONS** Extension of time for Completion of the Contract in the event of exceptional adverse climatic conditions (with reference to point (c) under sub-clause 8.5) rainfall shall only be allowed in accordance with the following formula. No additional extension of Time for Completion caused by exceptionally adverse climatic conditions will be allowed: $V = (N_w - N_n) + (R_w - R_n)/20$ *Where:* V = Extension of time in calendar days for the calendar month under consideration Nw = Actual number of days during the calendar month under consideration on which a rainfall of 10mm and more is recorded

Clause	Description
	R_w = Actual total rainfall in mm recorded during the calendar month under consideration Nn = Average number of days, derived from rainfall records, on which a rainfall of 10mm and more was Rn = Average total rainfall in mm for the relevant calendar month, derived from rainfall records, as tabulated hereinafter Where the extension of time due to abnormal rainfall has to be calculated for portion of a calendar month, pro rata values shall be used. Should V be negative for any particular month, and should its value when converted to a positive vale exceed the corresponding value of N_n, then V shall be taken as being equal to minus N_n. The total extension of time to be granted shall be the algebraic sum of all the monthly extensions, provided that if this total is negative then the time for completion shall not be reduced due to subnormal rainfall. Rainfall records for the period of construction shall be taken on Site. The Contractor shall provide and install all the necessary equipment for accurately measuring the rainfall. The Contractor shall also provide, erect and maintain a security fence plus gate, padlock and keys at each measuring station, all at his own cost. The Engineer or his assistant shall take and record the daily rainfall readings. The Contractor shall be permitted to attend these readings, in the company of the Engineer or his assistant. Access to the measuring gauge(s) shall at all times be under the Engineer's control. The rainfall records applicable to this Contract are those recorded at Weather Station 0061766 W. The following values of N_n and R_n shall apply:

Month	Rn (mm)	N_n (days)
January	2	1
February	1	1
March	3	1
April	16	2
May	30	2
June	40	5
July	36	6
August	34	4
September	18	3
October	11	2
November	5	1
December	2	1
Totals	**243**	**28**

The time period specified as the time for completion includes allowances for those days on which it is expected that work, on the critical patch items of the works, would be prevented due to abnormal climatic conditions such as wind, rain or the subsequent waterlogged conditions.

The Engineer shall upon considering all the relevant factors determine the extension of time to be granted on the basis that an extension of time to the contract will only be granted if the total number of days upon which work on the critical path was prevented exceeds the total number of days calculated in terms of the above allowance and considering the official contract period as a whole."

9.	**TESTS ON COMPLETION**
9.1	**CONTRACTOR'S OBLIGATIONS**
	Replace the fifth paragraph with the following:

Clause	Description
	"Unless otherwise stated in the Employer's Requirements, the Tests on Completion shall be carried out in stages in the following sequence: (a) pre-commissioning tests (on or off the Site, as appropriate), which shall include the appropriate inspections and ("dry" or "cold") functional tests to demonstrate that each item of the Works or Section can safely undertake the next stage under sub-paragraph (b) below; (b) commissioning tests, which shall include the operational tests specified in the Employer's Requirements to demonstrate that the Works or Section can be operated safely and as specified in the Employer's Requirements, under all available operating conditions; and (c) 28-day continuous trial operation period (under available operating conditions), which shall demonstrate that the Works or Section perform reliably and in accordance with the Contract. The tests of each stage described in sub-paragraphs (b) and (c) above shall not be commenced until the Works or Section have passed the previous stage. During trial operation, when the Works or Section (as the case may be) are operating under stable conditions, the Contractor shall give a Notice to the Engineer that they are ready for any other Tests on Completion, including performance tests. Performance tests shall be carried out to demonstrate whether the Works or Section comply with the performance criteria specified in the Employer's Requirements and with the Schedule of Performance Guarantees. Trial operation, including performance testing, shall not constitute a taking over under Clause 10 *[Employer's Taking* Over], Any product produced by, and any revenue or other benefit resulting from, trial operation under this Sub-Clause shall be the property of the Employer. As soon as the Works or Section have, in the Contractor's opinion, passed each stage of the Tests on Completion described in sub-paragraphs (a) to (c) above, the Contractor shall submit a certified report of the results of these tests to the Engineer. The Engineer shall Review each such report and may give a Notice to the Contractor stating the extent to which the results of the tests do not comply with the Contract. If the Engineer does not give such a Notice within 14 days after receiving the results of the tests, the Engineer shall be deemed to have given a Notice of No-objection."
10.2	**TAKING OVER OF PARTS OF THE WORKS** **Delete all wording of 10.2 and replace with:** "The Contractor shall stay liable and care for the equipment up to the date of the issue of the Taking Over Certificate after passing the Tests on Completion. This will include period the Employer use the installation during the commissioning, optimization, and Trial Operating Period. It shall also include all structures or buildings constructed as part of the project that forms part of the permanent works. Any part of the plant shall not be Deemed Taken Over due to the normal use by the Employer. Requests for Taking Over of Parts of the Works is <u>not</u> allowed. Due to the nature of the project, the complete installation (including all construction work) shall only be taken over as a whole once the Tests on Completion was passed and the Taking-Over Certificate is issued."
11.10	**UNFULFILLED OBLIGATIONS** **Delete the second paragraph and replace with:** "The Contractor's liability in relation to Plant and Designs of Permanent Works done by the Contractor for any latent defects shall continue beyond the date of the Performance Certificate for the period(s) stated in the Contract Data, specific to each listed discipline, starting the on the day after the date of the Performance Certificate. The Employer shall have no claim against the Contractor arising out of any latent defect which first manifests itself later than the period stated in the Contract Data"
13.1	**RIGHT TO VARY** **Add the following paragraph before the first paragraph:** "The contingency amount or provisional sum or portion thereof can only be committed through a variation order and must be approved by the Employer. The Engineer does not have the authority to approve variations and shall only act on instructions by the Employer and parties mentioned under Clause 13.3."
13.3	**VARIATION PROCEDURE** **Add the following paragraph at the end of the first paragraph:**

Clause	Description
	"The Engineer does not have the authority to approve variations and shall only act on instructions by the Employer. Any extension of time must be approved by the Employer, whether there is a cost implication or not."
13.4	**PROVISIONAL SUMS** Add the following paragraph before the first paragraph: "The provisional sum or portion thereof can only be committed through a variation order and must be approved by the Employer."
13.7	**ADJUSTMENTS FOR CHANGES IN COST** Add the following wording at the end of the Sub-Clause: "An escalation provisional amount based on a percentage of the contract value shall be included in the summary page. The Accepted Contract Amount shall be deemed to have included amounts to cover the contingency of all other rises and falls in costs not covered by the provisions of this or other Clauses. No allowance will be made for change in Rate of Exchange (ROE) and variations in costs of special materials. No additional claims will be allowed. Claims for adjustments for changes in cost shall be supported by such documentary evidence that may be required by the Engineer. Failure to render this information may result in the rejection of claims for price adjustment. Contract Price Adjustment shall only apply for the period beyond twelve (12) months from the expiry date of the original tender validity period. Adjustment to the Contract Price for the design, manufacture, painting, testing, supply, delivery, offloading and storage of Plant and Materials manufactured in the Republic of South Africa, shall be allowed only for variations in the cost of labour and material based on the indices published by the Steel and Engineering Industries Federation of South Africa (SEIFSA) for Mechanical and Electrical Works. The following SEIFSA **tables** shall be regarded as relevant to Mechanical and Electrical Works in this Contract: Table C3 – Index of actual labour cost Table G1 – Statistics SA - production price index, Mechanical and Electrical Engineering Materials, as applicable Table E-EX – Merchant Steel Price Index, Hot Rolled Sheets The applicable **Formula** for Mechanical and Electrical Plant and Material is: $$A = \left(a + b\frac{Ln}{Lo} + c\frac{Mn}{Mo} + d\frac{En}{Eo} + e\frac{Sn}{So}\right) - 1$$ Where, A – Adjustment Factor (rounded to 6th decimal) a – 0.15 (Fixed coefficient) b – 0.15 c – 0.35 d – 0.20 e – 0.15 (Coefficients (sum equal to 0.85)) Ln - Current labour index in Table C3 Lo - Base labour index in Table C3 Mn - Current mechanical engineering materials index in Table G Mo - Base mechanical engineering materials index in Table G En - Current electrical engineering materials index in Table G Eo - Base electrical engineering materials index in Table G Sn - Current steel price index in Table G So - Base steel price index in Table G "**Current**" indices are those applicable 42 days prior to date of claim "**Base**" indices are those applicable at Base Date, as stated in 1.1.4.

Clause	Description
	Adjustment to the Contract Price for the "Concrete Works", shall be allowed only for variations in the cost of labour and material based on the indices published by the South African Forum of Civil Engineering Contractors (SAFCEC) for Civil and Building Works. The following SAFCEC **tables** shall be regarded as relevant to Civil Works in this Contract: In terms of foregoing, the value of the certificates for Civil Works issued shall be adjusted in accordance with the Contract Price Adjustment Factor in terms of the General Conditions of Contract for Construction Works (Third Edition, 2015) with the following formula and values for "Concrete Works": $$CPAF = (1 - x)\left[\frac{aLt}{Lo} + \frac{bPt}{Po} + \frac{cMt}{Mo} + \frac{dFt}{Fo} - 1\right]$$ The value of "x" is 0.10. The values of the coefficients for "Concrete Works" are: a = 0.25 b = 0.15 c = 0.55 d = 0.05 "**Current**" indices are those applicable 42 days prior to date of claim "**Base**" indices are those applicable at Base Date, as stated in 1.1.4. Furthermore, the Contract Price Adjustment Schedule shall be amended as follows: a) "L" is the "Labour Index" and shall be the Consumer Price Index (CPI) for "All items (CPI Headline)", as published in the Statistical News Release, P0141: Table A – Consumer Price Index: Main Indices of Statistics South Africa. b) "P" is the "Plant Index" and shall be the Construction Materials Price Index for "Plant and Equipment" as published in the Statistical News Release, P0151.1: Table 4 – Mining and Construction Plant and Equipment Price Index of Statistics South Africa. c) "M" is the "Materials Index" and shall be the Construction Materials Index for selected materials, Materials for "Civil Engineering material (excluding bitumen)," as published in the Statistical News Release, P0151.1: Table 6 – Civil Engineering Material Price Index of Statistics South Africa. "F" is the "Fuel Index" and shall be the Producer Price Index (PPI) for "Coal and Petroleum Products – Diesel", as published in the Statistical News Release, P0142.1: Table 1 – PPI for Final Manufactured Goods of Statistics South Africa."
14.2	**Advance Payment** Not applicable. **Add the following wording after the first paragraph:** "The Contractor shall allow for the required financing to cover of all deposits required by suppliers when confirming orders or interim payments required by the supplier to release equipment for shipping. The Employer shall not make any interim payments on any equipment (either deposits or payment required to release equipment from suppliers). The financing costs must be included with the relevant and applicable equipment component costs and no additional claims will be entertained."
14.5	**PLANT AND MATERIAL INTENDED FOR THE WORKS** Payment for Plant and Material intended for the works is applicable and shall only be done according to sub-paragraph (a) and (c). Sub-paragraph (b) is not applicable. **In Sub-Clause 14.5 add paragraph (c)(iii) and (c)(iv):** "(iii) Have been procured and are properly stored off site at the premised of the Contractor within the Republic of South Africa, are protected against loss, damage or deterioration, appear to be in accordance with the Contract, are demarcated and clearly marked as the property of the Employer. The Contractor shall in writing provide documentary proof from the insurance company that these items are fully covered by the insurance policy concerned while the plant and equipment are stored away from the Site (street address of store to be stated) Should the Contractor's premises not be in Cape Town, Western Cape, the Contractor shall allow for the applicable travelling costs under their Preliminary and General section for the Engineer to do the inspection of the Plant and Materials at the premises of the Contractor. .

Clause	Description
	(iv) A written undertaking by the Contractor that the Contractor will deliver to the Employer (prior to submitting the next Statement) a bank guarantee in a form and issued by an entity to which the Employer gives consent (but such consent shall not relieve the Contractor from any obligation in the following provisions of this sub-paragraph), in amounts and currencies equal to the amount due under this Sub-Clause. This guarantee shall be in a similar form to the form described in Sub-Clause 14.5.1 of which a Pro Forma is included in Part C1: C1.3 PRO FORMA - FORM OF PAYMENT GUARANTEE FOR PLANT AND MATERIAL ON SITE OR OFF SITE and shall be valid until the Plant and Materials are properly built into the Works and included under Sub-Clause 14.3 (i) – value of Works executed." **In the last paragraph of the sub-clause, delete the second sentence and replace it with:** "The Engineer shall have no obligation to certify any payment under this Sub-Clause until the Employer has received the bank guarantee in accordance with sub-paragraph (c)(iii) above." **Add the following to the end of the last paragraph:** "Notwithstanding any other provisions, any payment for Plant and Material not forming part of the Permanent Works under Sub-Clause 14.3 (i) – value of Works executed, will not exceed the amount of a valid Payment Guarantee for Plant and Material on site or off site as provided by the Contractor. Only technically compliant Plant and Material shall be certified as Material On Site or Material Off Site. Where specified that equipment must be Factory Acceptance Tested (as per section C3, Scope of Works), the equipment must first pass the tests and be delivered to the site to be eligible for payment under this clause" **After the last paragraph, add the following sub-clause:**
14.5.1	"14.5.1 FORM OF PAYMENT GUARANTEE FOR PLANT AND MATERIAL ON SITE OR OFF SITE The Contractor shall obtain (at the Contractor's cost) a Form of Payment Guarantee for Plant and Materials On Site or Off Site in amounts and currencies equal to the advance payment, and shall submit it to the Employer with a copy to the Engineer. This guarantee shall be issued by an entity and from within a country (or other jurisdiction) to which the Employer gives consent, and shall be based on the sample form included in the tender documents or on another form agreed by the Employer (but such consent and/or agreement shall not relieve the Contractor from any obligation under this Sub-Clause). The Contractor shall ensure that the Payment Guarantee is valid and enforceable until the advance payment has been repaid, but its amount may be progressively reduced by the amount repaid by the Contractor as stated in the Payment Certificates. If the terms of the Payment Guarantee specify its expiry date, and the advance payment has not been repaid by the date 28 days before the expiry date: a) the Contractor shall extend the validity of this guarantee until the advance payment has been repaid; b) the Contractor shall immediately submit evidence of this extension to the Employer, with a copy to the Engineer; and c) if the Employer does not receive this evidence 7 days before the expiry date of this guarantee, the Employer shall be entitled to claim under the guarantee the amount of advance payment which has not been repaid."
14.15	**CURRENCIES OF PAYMENT** **Delete the all wording of the sub-clause and replace with:** "The currency of account shall be the Local Currency and all payments made in accordance with the contract shall be in Local Currency as named in the Contract Data."
19.	**Insurance**
19.1	**General Requirements** **Add the following at the end of the second last paragraph:** "The Contractor shall be liable for the payment of all deductibles."

Clause	Description
19.2	**INSURANCES TO BE PROVIDED BY THE CONTRACTOR** **Delete the first line of the sub-clause and replace with:** "The contractor will not be allowed on site until proof of all insurances has been submitted to -and approved by the Employer. The Contractor shall provide the following insurances (proof of cover, schedules and policy wording) within 14 days from the Letter of Acceptance:"
19.2.6	**OTHER INSURANCES REQUIRED BY LAWS AND LOCAL PRACTICE** **Add the following wording after second paragraph:** "Other insurances which are to be effected and maintained by the Contractor and endorsed to note the interests of the Employer are: (i) transit insurance on route to Site, including whilst in temporary storage (and intended for incorporation in the Contract), and (ii) where the Contract involves manufacturing and/or fabrication of the Works or part thereof at premises other than the Site, the Contractor shall satisfy the Employer that all materials and equipment for incorporation in the Works are adequately insured during manufacture and/or fabrication. In the event of the Employer having an insurable interest in such Works during manufacture or fabrication then such interest shall be noted by endorsement to the Contractor's policies of insurance".
21.1	**CONSTITUTION OF THE DAAB** **Add the following wording at the end of the second paragraph:** "If the Parties cannot agree on the sole member of the DAAB, three persons shall be appointed as provided for in 21.1."
21.2	**FAILURE TO AGREE DISPUTE ADJUDICATION BOARD** The entity referred to in this paragraph will be the President of the Consulting Engineers South Africa (CESA) or a person appointed by the President of CESA.
21.8	**NO DAAB IN PLACE** **Delete sub-paragraphs (a) and (b) and replace with:** **"(a)** And the Parties fail to agree on an the appointment within 14 days, then either Party may apply to the appointing entity or official named in the Contract Data in Sub-Clause 21.2, to appoint such DAAB."

Part 2: Data Provided by the Contractor

1.1.2.3	The Contractor is:
1.3	**The Contractor's address for receipt of communications is:**
	Telephone:
	Facsimile:
	E-mail:
	Address (Postal):
	Address (Physical):
1.1.84	**Time for Completion** The Time for Completion for the Contract is ……. days
4.3	**Contractor's Representative** The key persons and their position in relation to the scope of works are: **Position** **Full name and Surname**
	Contractor's Representative (Contracts Manager)
	Construction Manager
	Foreman
	Health and Safety Officer
21.1	List of proposed members of DAAB 1. ……. 2. ……. 3. ……..

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

Name..... Position.....

Tenderer.....

C1.3 Form of Performance Guarantee

Guarantee No.: _____ [*insert guarantee reference number].*

The Guarantor: _____
[insert name and address of place of issue, unless indicated in the letterhead].

Name of Contract/Contract No.: _____ *[insert reference number or other information identifying the contract between the Applicant and the Beneficiary on which the guarantee is based].*

The Beneficiary (the "Employer"): _____

_____ *[insert name and address of the Beneficiary]*

We have been informed that _____ [*insert name and address of the Contractor]* (hereinafter called the "Applicant") is your Contractor under such Contract, which requires him/her to obtain a Performance Security.

At the request of the Applicant, we _____ *[insert name of Guarantor]* hereby irrevocably undertake to pay you, the Beneficiary/Employer, any sum or sums not exceeding in total

the amount of _____

_____
[insert in figures and words the maximum amount payable and the currency in which it is payable] (the "Guaranteed Amount") upon receipt by us of your demand in writing and your written statement indicating in what respect the Applicant is in breach of its obligations under the Contract.

[Following receipt by us of an authenticated copy of the Taking-Over Certificate for the whole of the Works under Clause 10 of the Conditions of Contract, the Guaranteed Amount shall be reduced by _____ % and we shall promptly notify you that we have received such certificate and have reduced the Guaranteed Amount accordingly.][(1)]

Following receipt by us of an authenticated copy of a statement issued by _____

_____ *[insert name and address of the Engineer under the Contract]* that, pursuant to Sub-Clause 4.2.1 of the Conditions of Contract, variations or adjustments under Clause 13 of the Conditions of Contract have resulted in an accumulative increase or decrease of the Contract Price by more than twenty percent (20%) of the Accepted Contract Amount, and that therefore the Guaranteed Amount should be adjusted by the percentage specified in the statement equal to the accumulative increase or decrease, respectively, we shall promptly inform you that we have received such statement and have adjusted the Guaranteed Amount accordingly. In the case of a request for a decrease of the amount of the Performance Security, the above statement shall be accompanied by your written consent to such decrease.

Any demand for payment must contain your signature(s) which must be authenticated by your bankers or by a notary public. The authenticated demand and statement must be received by us at the following office _____

_____*[insert address of office]* on or before

_____ *[insert the date 70 days after the expected expiry of the Defects Notification Period for the Works]* (the "Expiry Date"), when this guarantee shall expire.

The party liable for the payment of any charges: _____ *[insert the name of the party].*

The guarantee shall be governed by the laws of _____ *[insert the law governing the guarantee]*, and shall be subject to the Uniform Rules for Demand Guarantees, (URDG) 2010 Revision, ICC Publication No. 758.

LANGEBERG MUNICIPALITY

TENDER NO. 13/2026

UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1

SIGNED by: _____ SIGNED by[2]: _____
(signature) *(signature)*

_____ _____
(name) *(name)*

Date: _____

[1] *When drafting the tender documents, the writer should ascertain whether to include the optional text, shown in parentheses [ ].*
[2] *Whether one or more signatories for the bank are required will depend on the bank and/or applicable law.*

LANGEBERG MUNICIPALITY

TENDER NO. 13/2026

UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1

C1.4 Occupational Health and Safety Agreement

AGREEMENT MADE AND ENTERED INTO BETWEEN (HEREINAFTER CALLED THE "EMPLOYER") AND

_____
(Contractor/Mandatory/Company/CC Name)

IN TERMS OF SECTION 37(2) OF THE OCCUPATIONAL HEALTH AND SAFETY ACT, ACT No. 85 OF 1993 AS AMENDED.

I, _____, representing

_____ , as an employer in its own right, do hereby undertake to ensure, as far as is reasonably practicable, that all work will be performed, and all equipment, machinery or plant used in such a manner as to comply with the provisions of the Occupational Health and Safety Act (OHSA) and the Regulations promulgated thereunder.

I furthermore confirm that I am/we are registered with the Compensation Commissioner and that all registration and assessment monies due to the Compensation Commissioner have been fully paid or that I/We are insured with an approved licensed compensation insurer.

COID ACT Registration Number:

OR Compensation Insurer: _____ Policy No.: _____

I undertake to appoint, where required, suitable competent persons, in writing, in terms of the requirements of OHSA and the Regulations and to charge him/them with the duty of ensuring that the provisions of OHSA and Regulations as well as the Council's Special Conditions of Contract, Way Leave, Lock-Out and Work Permit Procedures are adhered to as far as reasonably practicable.

I further undertake to ensure that any subcontractors employed by me will enter into an Occupational Health and Safety agreement separately, and that such subcontractors comply with the conditions set.

I hereby declare that I have read and understand the appended Occupational Health and Safety Conditions and undertake to comply therewith at all times.

I hereby also undertake to comply with the Occupational Health and Safety Specification and Plan.

Signed at _____ on the _____day of _____ 20 _____

_____ _____
Witness **Mandatory**

Signed at _____ on the _____ day of _____20 _____

_____ _____
Witness for and on behalf of Langeberg Municipality

OCCUPATIONAL HEALTH AND SAFETY CONDITIONS

1. The Chief Executive Officer of the Contractor shall assume the responsibility in terms of Section 16(1) of the Occupational Health and Safety Act (as amended). Should the Contractor assign any duty in terms of Section 16(2), a copy of such assignment shall immediately be provided to the representative of the Employer as defined in the Contract.

2. All work performed on the Employer's premises shall be performed under the supervision of the construction supervisor who understand the hazards associated with any work that the Contractor performs on the site in terms of Construction Regulations 2014 (as amended).

3. The Contractor shall appoint a Competent Person who shall be trained on any occupational health and safety aspect pertaining to them or to the work that is to be performed.

4. The Contractor shall ensure that he familiarises himself with the requirements of the Occupational Health and Safety Act and the Construction Regulations and that he, his employees, and any sub-contractors, comply with them.

5. Discipline in the interests of occupational health and safety shall be strictly enforced.

6. Personal protective equipment shall be issued by the Contractor as required and shall be worn at all times where necessary.

7. Written safe work procedures and appropriate precautionary measures shall be available and enforced, and all employees shall be made conversant with the contents of these practices.

8. No substandard equipment/machinery/articles or substances shall be used on the site.

9. All incidents referred to in terms of Section 24 of the Occupational Health and Safety Act shall be reported by the Contractor to the Department of Labour and the Employer.

10 The Employer hereby obtains an interest in the issue of any formal inquiry conducted in terms of Section 32 of the Occupational Health and Safety Act and into any incident involving a Contractor and/or his employees and/or his sub-contractor/s.

11. No use shall be made of any of the Employer's machinery/plant/equipment/substance/personal protective equipment or any other article without prior arrangement and written approval.

12. No alcohol or any other intoxicating substance shall be allowed on the site. Any person suspected of being under the influence of alcohol or any other intoxicating substance shall not be permitted access to, or allowed to remain on the site.

13. Prior to commencement of any work, verified copies of all documents mentioned in the agreement, must be presented to the Employer.

C1.5 Pro Forma Form of Advance Payment Guarantee

Guarantee No.: _____ [*insert guarantee reference number*]

The Guarantor: _____
[insert name and address of place of issue, unless indicated in the letterhead]

Name of Contract/Contract No.: _____

_____ *[insert reference number or other information identifying the contract between the Applicant and the Beneficiary on which the guarantee is based]*

The Beneficiary (the "Employer"): _____

_____ *[insert name and address of the Beneficiary]*

We have been informed that _____ [*insert name and address of the Contractor*] (hereinafter called the "Applicant") is your Contractor under such Contract and wishes to receive an advance payment, for which the Contract requires him/her to obtain a guarantee.

At the request of the Applicant, we _____ [*insert name of Guarantor*] hereby irrevocably undertake to pay you, the Beneficiary/Employer, any sum or sums not exceeding in total the amount of

_____

_____
[*insert in figures and words the maximum amount payable and the currency in which it is payable*] (the "Guaranteed Amount") upon receipt by us of your demand in writing and your written statement that:

(a) the Applicant has failed to repay the advance payment in accordance with the Conditions of Contract, and

(b) the amount of the advance payment which the Applicant has failed to repay.

The guarantee shall become effective upon receipt [*of the first instalment*] of the advance payment by the Applicant. The Guaranteed Amount shall be reduced by the amounts of the advance payment repaid to you, as evidenced by interim payment certificates issued under Sub-Clause 14.6 of the Conditions of Contract. Following receipt of a copy of each interim payment certificate, we shall promptly notify you of the revised Guaranteed Amount accordingly.

Any demand for payment must contain your signature(s) which must be authenticated by your bankers or by a notary public. The authenticated demand and statement must be received by us at the following office _____

_____ [*insert address of office*] on or before

_____[*insert the date 70 days after the expected expiry of the Time of Completion*] (the "Expiry Date"), when this guarantee shall expire.

The party liable for the payment of any charges: _____
[*insert the name of the party*].

This guarantee shall be governed by the laws of _____
[*insert the law governing the guarantee*], and shall be subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758.

Signed by: _____ Signed by[1]: _____

(Signature) *(Signature)*

_____ _____

(Name) *(Name)*

Date: _____

[1] Whether one or more signatories for the bank are required will depend on the bank and/or applicable law.

C1.6 Insurance Broker's Warranty

Pro Forma

Logo

Letterhead of Contractor's Insurance Broker

Date _____

LANGEBERG MUNICIPALITY
Municipal Manager
PRIVATE BAG X2
ASHTON
6715
TEL: 023 626 8200

Dear Sir

CONTRACT NO.: 13/2026

CONTRACT TITLE: UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1

NAME OF CONTRACTOR: _____

I, the undersigned, do hereby confirm and warrant that all the insurances required in terms of the abovementioned contract have been issued and/or in the case of blanket/umbrella policies, have been endorsed to reflect the interests of the LANGEBERG MUNICIPALITY with regard to the abovementioned contract, and that all the insurances and endorsements, etc., are all in accordance with the requirements of the contract.

I furthermore confirm that all premiums in the above regard have been paid.

Yours faithfully

Signed: _____

For: _____

Part C2: Pricing Data

PART C2: PRICING DATA 119

C2.1 PRICING ASSUMPTIONS 120
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C2.1 Pricing Assumptions

Pricing Assumptions mean the criteria as set out below, read together with all Parts of this contract document, which it will be assumed in the contract, that the tenderer has taken into account when developing his prices.

1. The method of measurement published by the South African Bureau of Standards in clause 8 of the Standardised Specifications for Civil Engineering Construction is applicable, subject to the variations and amendments contained in the section “Applicable SANS 1200 standardised specifications”.

2. Descriptions in the Bills of Quantities are abbreviated and comply generally with those in the Standardised Specifications. Clause 8 of each Standardised Specification, read together with the relevant clauses of the Scope of Work, set out what ancillary or associated activities are included in the rates for the operations specified. Should any requirements of the measurement and payment clause of the applicable Standardised Specification, or the Scope of Work, conflict with the terms of the Schedule, the requirements of the Standardised Specification or Scope of Work, as applicable, shall prevail.

3. The measurement and payment clauses in a specification in which further information regarding the scheduled items is given, are referenced under “Item” (pay items) in the Bills of Quantities. The referenced clauses are not necessarily the only sources of information in respect of scheduled items. Further information and specifications may be found elsewhere in the contract documents. Standardised Specifications are identified by the digits which follow SANS in the SANS 1200 series of specifications, e.g. G for SANS 1200 G.

4. Unless otherwise stated, items are measured net in accordance with the drawings, and no allowance is made for waste.

5. The quantities set out in the Bills of Quantities are the estimated quantities of the Contract Works, but the Contractor will be required to undertake whatever quantities may be directed by the Employer’s Agent from time to time. The Contract Price for the completed contract shall be computed from the actual quantities of work done, valued at the relevant unit rates and prices.

6. The prices and rates to be inserted in the Bills of Quantities are to be the full inclusive prices for the work described under the several items. Such prices and rates shall cover all costs and expenses that may be required in and for the execution of the work described, and shall cover the cost of all general risks, liabilities, and obligations set forth or implied in the documents on which the tender is based, as well as overhead charges and profit. Reasonable prices shall be inserted as these will be used as a basis for assessment of payment for additional work that may have to be carried out.

7. A price or rate should be entered against each item in the Bills of Quantities, whether the quantities are stated or not. **An item against which no rate is/are entered, or if anything other than a rate or a nil rate (for example, a zero, a dash or the word “included” or abbreviations thereof) is entered against an item, it will also be regarded as a nil rate having been entered against that item, i.e. that there is no charge for that item.** The Tenderer may be requested to clarify nil rates, or items regarded as having nil rates; and the Employer may also perform a risk analysis with regard to the reasonableness of such rates.

8. Except where rates only are required, insert all amounts to be included in the total tendered price in the "Amount" column and show the corresponding total tendered price.

9. The Tenderer shall fill in rates for all items where the words “rate only” appear in the “Total” column. “Rate Only” items have been included where:

(a) an alternative item or material is contemplated:
(b) variations of specified components in the make-up of a pay item may be expected; and
(c) no work under the item is foreseen at the tender stage but the possibility that such work may be required is not excluded.

For “Rate Only” items no quantities are given in the “Quantity” column but the quoted rate shall apply in the event of work under this item being required. The Tenderer shall however note that in terms of the Tender Data the Tenderer may be asked to reconsider any such rates which the Purchaser may regard as unbalanced.

10. Where Provisional sums or Prime Cost sums are provided for items in the Bill of Quantities, payment for the work done under such items will be made in accordance with the Contract Specifications. The Purchaser reserves the right, during the execution of the works, to adjust the stated amounts upwards or downwards according to the work actually done under the item, or the item may be omitted altogether, without affecting the validity of the Contract.

    The Tenderer shall not under any circumstance whatsoever delete or amend any of the sums inserted in the “Amount” column of the Bill of Quantities and in the Summary of the Bill of Quantities unless ordered or authorized in writing by the Purchaser before closure of tenders. Unauthorized changes made by the Tenderer to provisional items in the Bill of Quantities, or to the stated provisional percentages and sums in the Summary of the Bill of Quantities, will not be tolerated.

11. Arithmetical errors found in the Bill of Quantities as a result of faulty multiplication of addition, will be corrected by the Purchaser’s Agent at the tender evaluation stage, as set out in the Condition of Tender and the Tender Data

12. Incorrect entries shall not be erased or obliterated with correction fluid but must be crossed out neatly. The correct figures must be entered above or adjacent to the deleted entry, and the alteration must be initialled by the Tenderer.

13. The units of measurement described in the Bills of Quantities are metric units. Abbreviations which may be used in these Bills of Quantities are as follows:

mm	=	millimetre	h	=	hour
m	=	metre	kg	=	kilogram
km	=	kilometre	t	=	ton (1000 kg)
m2	=	square metre	No.	=	number
m2.pass	=	square metre-pass	sum	=	lump sum
ha	=	hectare	MN	=	meganewton
m3	=	cubic metre	MN.m	=	meganewton-metre
m3.km	=	cubic metre-kilometre	P C sum	=	Prime Cost sum
l	=	litre	Prov sum	=	Provisional sum
kl	=	kilolitre	%	=	per cent
MPa	=	megapascal	kW	=	kilowatt

14. Where fractions of a cent occur in calculations of prices and amounts, they shall be rounded up/down to the nearest whole cent.

15. The Tenderer is referred to C.2.24 in Part T1.2 Tender Data regarding the pricing of Deviations and/or Qualifications.

16. All descriptions or clauses where trade names or proprietary products are specified, are deemed to include the phrase “or equal approved”

17. Tenderers are referred to Clause 6.8.2 in Part C1.2 Contract Data regarding contract price adjustment.

The following bills in Part C2.2 Bills of Quantities are deemed applicable to the following categories for the purposes of Contract Price Adjustment:

NO.	BILL	CPA CATEGORY
1.	NONE	

C2.2 Bills of Quantities

Bid specifications may not make any reference to any particular trade mark, name, patent, design, type, specific origin or producer, unless there is no other sufficiently precise or intelligible way of describing the characteristics of the work, in which case such reference must be accompanied by the words “or equivalent”.

TENDERERS MUST NOTE THAT WHEREVER THIS DOCUMENT REFERS TO ANY PARTICULAR TRADE MARK, NAME, PATENT, DESIGN, TYPE, SPECIFIC ORIGIN OR PRODUCER, SUCH REFERENCE SHALL BE DEEMED TO BE ACCOMPANIED BY THE WORDS ‘OR EQUIVALENT”

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
A	SABS 1200 A	**GENERAL**				
		as specified in SABS 1200 A and in the project specifications				
	8.3	FIXED CHARGES AND VALUE RELATED ITEMS				
A.1	PSA 8.3.1	Fixed preliminary and general charges	Sum	1		
A.2	PSA 8.3.2	Value related preliminary and general charges	Sum	1		
	PSA 8.3.5	Cost of survey in terms of Land Survey Act:				
A.3		Locate, record, protect and reinstate pegs	Sum	1		
	PSA 8.4	SCHEDULED TIME RELATED ITEMS				
	PSA 8.4.1	Time related preliminary and general charges :				
A.4	PSA 8.4.1.1	The contract period during the normal industry working period (outside public holidays and the industry shutdown period during December and January)	Sum	1		
A.5	PSA 8.4.1.2	Public Holidays	No	7		
A.6	PSA 8.4.1.3	SAFCEC recommended shutdown period during December and January	Sum	1		
	PSA 8.5	SUMS STATED PROVISIONALLY BY ENGINEER				
	PSA 8.5.1	Works executed by the Contractor:				
A.7		(e) The raising or lowering of water pipelines	Prov Sum	1	20,000.00	20,000.00
A.8		(f) Charge required by the Contractor on sub-item (e) above	x100%	20,000.00		
	PSA 8.6	PRIME COST SUMS				
		(1) Communication allowances:				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
A.9		(a) The cost of calls in connection with contract administration and telephone and cellular telephone rental	PCSum	1	20,000.00	20,000.00
A.10		(b) Charge required by Contractor on sub-item (a) above	%	20,000.00		
		(2) Additional testing of materials required by Engineer:				
A.11		(a) Cost of testing	PCSum	1	25,000.00	25,000.00
A.12		(b) Charge required by Contractor on sub-item (a) above	%	25,000.00		
		(4) As built surveys:				
A.13		(a) Cost of as built surveys	PCSum	1	15,000.00	15,000.00
A.14		(b) Charge required by Contractor on sub-item (a) above	x100%	15,000		
	PSA 8.7	DAYWORK				
	8.7.1	Dayworks:				
		(a) Vehicles, plant and equipment:				
		(3) Hydraulic excavator with bucket at least 500 mm wide				
A.15		20 Ton (> 115kW @ 1800 rmp)	h	5		
A.16		25 Ton (> 130 kW @ 2000 rmp)	h	5		
A.17		30 Ton (>145 kW @ 1800 rmp)	h	5		
A.18		(4) Loader Backhoe	h	10		
A.19		(5) Dumper (> 10m³ capacity)	h	10		
A.20		(6) Tipper truck, more than 5m³ capacity	h	5		
A.21		(8) Flat bed truck equipped with hydraulic crane of more than 2 t capacity	h	5		
		(9) Water trucks:				
A.22		(i) 12 kℓ capacity	h	20		
		(11) Compressors:				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
A.23		(i) Up to 10m³/minute	h	5		
		(12) Concrete mixer:				
A.24		(ii) Over 400 l capacity	h	100		
		(13) Water pump:				
A.25		(i) 200 ℓ/min capacity @10m head	h	50		
A.26		(ii) 600 ℓ/minute capacity @ 10m head	h	100		
A.27		(iii) 1200 ℓ/minute capacity @10m head)	h	100		
		Labour:				
		(a) Labour:				
A.28		(1) Labourer	h	40		
A.29		(2) Semi-skilled labourer	h	10		
A.30		(3) Skilled labourer	h	10		
A.31		(4) Artisan	h	10		
A.32		(5) Team Leader	h	5		
A.33		(6) Foreman	h	5		
A.34		(7) Surveyor	h	10		
	PSA 8.8	TEMPORARY WORKS				
A.35	PSA 8.8.2	Accommodation of traffic	Sum	1		
	PSA 8.8.4	Location and protection of existing services:				
	PSA 8.8.4.1	Provision of detecting devices for:				
A.36		(a) Water and sewer pipes	Sum	1		
A.37		(b) Electrical and other cables	Sum	1		
	PSA 8.8.4.2	Hand excavation necessary for locating and exposing existing services in all materials:				
A.38		(a) In roadways	m³	100		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
A.39		(b) In all other areas	m³	50		
	PSA 8.8.7	Dealing with water:				
A.40		(a) Dealing with subsurface water	Sum	1		
A.41		(b) Dealing with surface water	Sum	1		
	PSA 8.8.8	Temporary fence minimum 1,2 m high				
A.42		(a) 1,2 m high	m	500		
A.43	PSA 8.8.9	Dismantle and re-erect temporary 1,2 m high fence	m	500		
A.44	PSA 8.8.10	Dust control	Sum	1		
A.45	PSA 8.10	Accommodating other Contractors	Sum	1		
A.46	PSA 8.12	Compliance with the Occupational Health and Safety Act (Act No 85 of 1993) and Construction Regulations and specifications included in the Particular Specification	Sum	1		
A.47	PSA 8.13	Compliance with the Environmental Management Plan and requirements included in the Particular Specification	Sum	1		
A.48	PSA 8.17	Photographic Record	Sum	1		
A.49	PSA 8.19	Liaison with residents and the local authority	Sum	1		
A.50	PSA 8.20	Record of test results and related administration	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
1	GENERAL	

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
B	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
		Pipeline routes				
B.1		3 m wide	m²	1,065		
	8.2.2	Remove and grub large trees and tree stumps of girth over and up to				
B.2		Over 1,0 m up to and including 2,0 m	No	1		
B.3		Over 2,0 m up to and including 3,0 m	No	1		
B.4	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	50		
B.5	PSC 8.2.7	Dismantle and remove pipelines encased in concrete	m	10		
B.6	8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	150		
B.7	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	10		
B.8	PSC 8.2.13	Take down and re-erect existing fences and deliver to municipal store	m	10		
B.9	PSC 8.2.15	Remove and dispose of kerbing	m	10		
B.10	PSC 8.2.17	Rip and clear tarred and paved areas	m²	10		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 DB : EARTHWORKS (PIPE TRENCHES)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 DB	**EARTHWORKS (PIPE TRENCHES)**				
		as specified in SABS 1200 DB and in the project specifications				
		PIPELINE TRENCHES				
	PSDB 8.3.2	Excavation:				
		Excavate in all materials for trenches, backfill, compact and dispose of surplus material:				
		(1) Pipes up to 125mm dia for depths:				
B.11		Up to 1,5m	m	40		
		(2) Pipes over 125 mm dia up to 400 mm dia for depths:				
B.12		Up to 1,5 m	m	155		
B.13		Over 1,5 m up to 2,5 m	m	5		
		(3) Pipes over 400 mm dia up to 550 mm dia for depths:				
B.14		Up to 1,5m	m	150		
B.15		Over 1,5m up to 2,5m	m	5		
	PSDB 8.3.2	(b) Extra over item (a) above for:				
B.16		(1) Intermediate excavation	m³	10		
B.17		(2) Hard rock excavation	m³	5		
B.18		(3) Hand excavation and backfill where directed by the Employer's Agent	m³	30		
B.19		(a) Soft material	m³	5		
B.20		(b) Intermediate material	m³	5		
B.21		(4) Backfill stabilized with 5% cement where directed by the Engineer	m³	1		
B.22		(6) Mass concrete Class 15 MPa/19mm encasing around pipes where directed by the Engineer	m³	2		
TOTAL CARRIED FORWARD						

SECTION 1200 DB : EARTHWORKS (PIPE TRENCHES)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B.23		(8) Backfill with clean sand compacted to 100% modified AASHTO density	m³	5		
B.24		(9) Boulder excavation	m³	2		
B.25	PSDB 8.3.2	(11) Excavate open drains in all materials	m³	2		
B.26		(c) Excavate and dispose of unsuitable material from trench bottom	m³	25		
	PSDB 8.3.3	Excavation ancillaries:				
	PSDB 8.3.3.1	Make up deficiency in backfill material:				
B.27		(c) by importation from commercial or off site sources selected by the Contractor (sand compacted to 100% Mod AASHTO)	m³	60		
B.28	PSDB 8.3.3.3	Compaction in road crossings	m³	60		
	PSDB 8.3.4	Particular items:				
		(a) Shore trench opposite structure or service or in restricted work space				
B.29		Depth up to 1.0m	m	10		
B.30		Over 1.0m up to 2.0m	m	10		
	8.3.5	Existing services that intersect or adjoin a pipe trench:				
		(a) Services that intersect a pipe trench:				
B.31		(1) LT electricity cables	No	1		
B.32		(2) HT electricity cables	No	1		
B.33		(3) Telkom	No	1		
B.34		(4) Watermains	No	10		
B.35		(5) Stormwater	No	1		
B.36		(6) Sewer	No	1		
		(b) Services that adjoin a trench:				
B.37		(2) HT electrical cables	m	5		
TOTAL CARRIED FORWARD						

SECTION 1200 DB : EARTHWORKS (PIPE TRENCHES)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B.38		(3) Watermains	m	50		
	PSDB 8.3.6	Finishing:				
	PSDB 8.3.6.1	Reinstate road surfaces complete with all courses:				
B.39		(c) Gravel roads	m²	150		
B.40		(f) Paving blocks	m²	10		
	PSDB 8.3.8	Removal of existing pipes:				
B.41		(a) Excavate in all materials to 300mm above the pipelines	m³	10		
B.42		(b) Hand excavation for removal by hand to expose pipes	m	5		
B.43		(c) Remove pipes from trench and stack for inspection	m	5		
		(d) Deliver pipes and specials declared re-usable:				
B.44		(i) Pipes	m	5		
B.45		(ii) Specials	No	2		
		(e) Dispose of pipes and specials unsuitable for re-use				
B.46		(i) Pipes	m	5		
B.47		(ii) Specials	No	2		
B.48		(f) Backfill and compact trench	m³	2		
B.49		(g) Make up deficiency in backfill material	m³	2		
B.50	PSDB 8.3.16	Compaction of trench invert in situ material to a depth of 300mm	m³	105		
	PSDB 8.3.17	Testing of trench related work				
		Insitu material at trench invert. (Test up to 1,5m below invert)				
B.51		1) DCP test by Contractor	No	10		
B.52		2) DCP test by Independent laboratory	No	2		
TOTAL CARRIED FORWARD						

SECTION 1200 DB : EARTHWORKS (PIPE TRENCHES)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		Bedding layer				
B.53		1) DCP test by Contractor	No	10		
B.54		2) DCP test by Independent laboratory	No	2		
B.55		3) Troxler test by independent laboratory	No	2		
B.56		4) Material classification analysis including CBR and grading analysis	No	2		
		Backfill of trenchess				
B.57		1) DCP test by Contractor	No	10		
B.58		2) DCP test by Independent laboratory	No	2		
B.59		3) Troxler test by independent laboratory	No	2		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 L : MEDIUM PRESSURE PIPELINES

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 L	**MEDIUM PRESSURE PIPELINES**				
		HDPE PIPES				
		as specified in SABS 1200 L and in the project specifications				
	PSL 8.2.1	Supply, lay and bed on bedding for flexible pipes, complete with couplings:				
		HDPE PE 100 PN6 pipes continuously butt welded SANS ISO 4427:1996 with the following diameters of pipe:				
B.60		50mm dia	m	40		
B.61		160mm dia	m	100		
B.62		315mm dia	m	60		
B.63		550mm dia	m	155		
	8.2.2	Extra over item 8.2.1 for the supplying, laying and bedding of moulded HDPE fttings for same class as main pipe, continuously butt welded to pipe.				
		11,25 degree bends				
B.64		160 mm dia	No	1		
B.65		315 mm dia	No	1		
B.66		550mm dia	No	1		
		22,5 degree bends				
B.67		160mm dia	No	1		
B.68		315mm dia	No	1		
B.69		550mm dia	No	4		
		45 degree bends				
B.70		160mm dia	No	1		
B.71		315mm dia	No	1		
B.72		550mm dia	No	1		
		90 degree bends				
B.73		50mm dia	No	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B.74		160mm dia	No	2		
B.75		315mm dia	No	3		
B.76		550mm dia	No	9		
		Extra over item 8.2.1 for the supplying, laying and bedding of HDPE specials and fittings continuously butt welded for HDPE pipes				
		Tees				
B.77		160mm dia equal tee	No	1		
B.78		550mm dia x 315mm dia	No	2		
		End caps: (HDPE) same class as pipe, continuously butt welded to pipe				
B.79		160mm dia	No	2		
B.80		315mm dia	No	2		
	PSL 8.2.11	Anchor blocks / thrust blocks and pedestals:				
		Concrete:				
B.81		Class 25MPa/19mm	m³	10		
		Formwork:				
B.82		Rough	m²	20		
		Reinforcement:				
B.83		High tensile steel	t	0.2		
	8.2.12	Concrete casing:				
B.84		Class 20MPa/19mm	m³	5		
	8.2.13	Valve and hydrant chambers, etc.:				
B.85		Valve chamber complete as per Dwg. No. 24203-C-004-104 (fittings measured under Mechanical schedule)	No	4		
	PSL 8.2.17	Marker blocks/pipeline route markers:				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B.86		(a) Supply and install pipeline route marker asper Dwg No. 24203-C-004-102	No	10		
	PSL 8.2.18	Connection to existing main supply pipe:				
B.87		160mm dia	No	1		
B.88		315mm dia	No	3		
B.89		550mm dia	No	1		
	PSL 8.2.30	Specific testing of HDPE pipe material as per SANS 4427 and SANS 6269				
B.90		Carbon Black Content test	No	12		
B.91		Carbon Black Dispension test	No	12		
B.92		Oxidation Induction Time test	No	12		
B.93		Melt Flow Rate test	No	12		
B.94		Tensile Test	No	12		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 LB : BEDDING (PIPES)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 LB	**BEDDING (PIPES)**				
		as specified in SABS 1200 LB and in the project specifications				
	8.2.2.3	From commercial sources:				
B.95		(a) Selected granular material	m³	152		
B.96		(b) Selected fill material	m³	67		
	PSLB 8.2.7	Provision of stone/geofabric to deal with water:				
B.97		19mm crushed stone	m³	30		
B.98		Geofabric (A2 or equivalent approved)	m²	50		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
1	SITE CLEARANCE	
2	EARTHWORKS (PIPE TRENCHES)	
3	MEDIUM PRESSURE PIPELINES	
4	BEDDING (PIPES)	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SECTION : SITE CLEARANCE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
C	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
C.1		Site	m²	10		
C.2	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	5		
C.3	PSC 8.2.7	Dismantle and remove pipelines encased in concrete	m	5		
	PSC 8.2.8	Demolish and remove structures				
C.4		i) Watermeter chamber	Sum	1		
C.5		ii) Belltoby valve chamber	Sum	1		
C.6	8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	1		
C.7	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	1		
C.8	PSC 8.2.19	Demolish and remove concrete slab irrespective of thickness	m²	2		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 D	**EARTHWORKS**				
		as specified in SABS 1200 D and in the project specifications				
	PSD 8.3	SCHEDULED ITEMS				
	PSD 8.3.3	Restricted excavation:				
		Excavate for footings in all materials, and use for backfill or embankment, or dispose				
C.9		(a) Excavate for inlet channel in all materials, and use for backfill or embankment, or dispose	m³	10		
		(b) Extra over item 8.3.3 above for:				
C.10		Intermediate excavation	m³	1		
C.11		Hard rock excavation	m³	1		
C.12		Boulder excavation Class A	m³	1		
C.13		Boulder excavation Class B	m³	1		
C.14	PSD 8.3.3 (c)	(c) Extra over item 8.3.3 (a) for hand excavation	m³	5		
	8.3.8.2	Dealing with services that are at risk because of the construction of earthworks:				
C.15		(a) Cables	No	1		
C.16		(c) Temporary protection of existing inlet pipeline from canal to WTW	Sum	1		
C.17	PSD 8.3.10	Topsoiling	m³	1		
C.18	PSD 8.3.16	Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor	m³	5		
C.19	PSD 8.3.19	Compaction of in-situ material to a depth of 300 mm	m²	10		
TOTAL CARRIED FORWARD TO SUMMARY						

CONCRETE (STRUCTURAL)

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 G	**CONCRETE (STRUCTURAL)**				
		as specified in SABS 1200 G and in the project specifications				
	8.2	FORMWORK				
	8.2.1	Rough:				
C.20		Vertical plane	m²	20		
	8.2.2	Smooth:				
		Walls:				
C.21		RC walls	m²	15		
C.22	8.2.5	Narrow widths up to 25mm wide for chambers	m	25		
	8.3	REINFORCEMENT				
	PSG 8.3.1	Mild steel bars:				
C.23		Irrespective of diameter	t	0.10		
	PSG 8.3.1	High tenstile steel bars				
C.24		Irrespective of diameter	t	0.70		
	PSG 8.3.2	High-tensile welded mesh:				
C.25		Type reference 395	m²	6		
C.26		Type reference 617	m²	1		
	8.4	CONCRETE				
	8.4.2	Blinding layer in 15MPa/19mm concrete:				
		50mm minimum thickness:				
C.27		WTW Inlet Channel	m²	10		
	8.4.3	Strength concrete :				
		20 MPa/40 mm:				
C.28		Mass	m³	1		
		35MPa/19mm:				
C.29		Base slabs	m³	2		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
C.30		Walls	m³	3		
	8.4.4	Unformed surface finishes:				
C.31		(a) Wood-floated finish (see PSG 7.1)	m²	5		
C.32		(b) Steel-floated finish (see PSG 7.2):	m²	5		
	8.5	JOINTS				
C.33		10 mm expansion joint, sealed with 25 mm x 10 mm approved polysulphide	m	15		
	PSG 8.10	Testing for watertightness:				
C.34		(a) WTW Inlet Channel	Sum	1		
C.35	PSG 8.13	Break into existing Zandrift Canal outlet, modify channel and make good	Sum	1		
C.36	PSG 8.13	Break into existing WTW inlet structure, modify channel and make good	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
1	SITE CLEARANCE	
2	EARTHWORKS	
3	CONCRETE (STRUCTURAL)	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
D.1		Site	m²	200		
D.2	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	5		
D.3	PSC 8.2.7	Dismantle and remove pipelines encased in concrete	m	5		
D.4	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	30		
D.5	PSC 8.2.17	Rip and clear tarred and paved areas	m²	15		
D.6	PSC 8.2.18	Remove and dispose of kerbing	m	10		
D.7	PSC 8.2.19	Demolish and remove concrete slab irrespective of thickness	m²	40		
D.8	PSC 8.2.20	Dismantle, move and re-erect light poles	No	1		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 D : EARTHWORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 D	**EARTHWORKS**				
		as specified in SABS 1200 D and in the project specifications				
	PSD 8.3	SCHEDULED ITEMS				
	PSD 8.3.3	Restricted excavation:				
		Excavate for footings in all materials, and use for backfill or embankment, or dispose				
D.9		(a) Excavate for Transfer PS building in all materials, and use for backfill or embankment, or dispose	m³	185		
		(b) Extra over item 8.3.3 above for:				
D.10		Intermediate excavation	m³	5		
D.11		Hard rock excavation	m³	1		
D.12		Boulder excavation Class A	m³	1		
D.13		Boulder excavation Class B	m³	1		
D.14	PSD 8.3.3 (c)	(c) Extra over item 8.3.3 (a) for hand excavation	m³	5		
D.15	PSD 8.3.4	Importing of materials from commercial sources and use for fill (clean sand, G7, compacted to 100% Mod AASHTO)	m³	15		
	8.3.8.2	Dealing with services that are at risk because of the construction of earthworks:				
D.16		(a) Cables	No	1		
D.17	PSD 8.3.10	Topsoiling	m³	5		
D.18	PSD 8.3.16	Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor	m³	25		
D.19	PSD 8.3.19	Compaction of in-situ material to a depth of 300 mm	m²	130		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS1200 G	**CONCRETE (STRUCTURAL)**				
		as specified in SABS 1200 G and in the project specifications				
	8.2	SCHEDULED FORMWORK ITEMS				
	8.2.1	Rough:				
		Vertical Plane				
D.20		All faces foundations	m²	150		
	8.2.2	Smooth:				
		Vertical Plane				
D.21		All faces of beams, supporting columns and walls	m²	100		
D.22	8.2.5	Narrow widths up to 25mm wide for chambers	m	20		
	8.2.6	Box out holes/form voids:				
		(a) Small, circular, of diameter up to and including 0.35m				
D.23		(1) 0m to 0.5m deep	No	5		
	PSG 8.3	SCHEDULED REINFORCEMENT ITEMS				
	PSG 8.3.1	Mild steel bars:				
D.24	8.3.1.1	Irrespective of diameter	t	0.2		
	8.3.1	High tensile steel bars:				
D.25	8.3.1.1	Irrespective of diameter	t	11		
	8.3.2	High tensile welded mesh re-inforcement				
D.26		Type ref 395	m²	30		
D.27		Type ref 617	m²	10		
	8.4	SCHEDULED CONCRETE ITEMS				
	8.4.2	Blinding layer in 20MPa/19mm concrete				
D.28		75mm minimum thickness	m²	115		
	8.4.3	Strength concrete:				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		20MPa/19mm concrete				
D.29		Mass concrete where instructed by the engineer	m³	5		
	8.4.3	35MPa/19mm concrete				
D.30		Foundation	m³	30		
D.31		Columns and beams	m³	35		
D.32		Surface beds in Pump Station	m³	10		
D.33		Topslab of sump	m³	5		
	8.4.4	UNFORMED SURFACE FINISHES				
		(a) Wood-floated finish (see PSG 7.1)				
D.34		Sump floor	m²	15		
		(b) Steel-floated finish:				
		Upper surfaces of:				
D.35		Walls	m²	20		
D.36		Surface bed of Pump Station	m²	50		
	8.5	JOINTS				
		Expansion joints: (See PSG 5.5.7.4)				
D.37		Supply and install 10mm wide expansion joint between surface bed and walls	m	60		
D.38		Construct 16mm wide by 30mm deep saw cut expansion joint in surface bed	m	60		
	8.7	GROUTING				
	(c)	GROUTING IN OF PIPES, EQUIPMENT AND ITEMS SUPPLIED BY OTHERS				
D.39		Dry packed grout	m³	2		
	PSG 8.10	Testing for water tightness				
D.40		(a) Transfer PS sump	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 L	**MEDIUM PRESSURE PIPELINES**				
		PVC-U PIPES				
		as specified in SABS 1200 L and in the project specifications				
	8.2.13	Valve and hydrant chambers, etc.:				
D.41		Bulk water meter chamber complete as per Dwg. No. 24203-C-007-102 (fittings measured under mechanical schedule)	No	1		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 ME : SUBBASE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 ME	**SUBBASE**				
		as specified in SABS 1200 ME and in the project specifications				
	PSME 8.3.3	Construct the subbase course/shoulders/gravel wearing course with material from commercial sources:				
D.42		Construct the G5 subbase course 150mm thick compacted to 95% MDD with material from commercial sources	m³	5		
D.43		Construct the G7 gravel wearing course 150mm thick compacted to 93% MOD (100% for clean sand)	m³	5		
	8.3.5	Process subbase material by one of the following processes, as relevant and use in the subbase:				
D.44		d) Stabilization	m³	5		
	8.3.8	Stabilization agent:				
D.45		b) CEM 1 Portland cement 32.5N	t	0.1		
	PSME 8.3.11	Treatment of subbase with:				
D.46		(a) Weed killer	m²	20		
D.47		(b) Insecticide	m²	20		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 MJ : SEGMENTED PAVING

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 MJ	**SEGMENTED PAVING**				
		as specified in SABS 1200 MJ and in the project specifications and in accordance with SANS 1058				
	PSMJ 8.2.1	Provision of edge restraints:				
		Flat restraints				
D.48		Radius 0 - 10m	m	5		
D.49		Straight	m	20		
	PSMJ 8.2.2	Construction of paving complete:				
		Interlocking units with herringbone pattern				
D.50		80mm thick Class 40/2.6	m²	20		
D.51	PSMJ 8.2.3	Cutting units to fit edge restraints	m	30		
D.52	8.2.4	Rolling to locked up condition as specified in 5.6.2	m²	20		
TOTAL CARRIED FORWARD TO SUMMARY						

as specified in SABS 1200 MJ and in the project specifications

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SABS 1200 MK	**KERBING AND CHANNELLING**				
		as specified in SABS 1200 MK and in the project specifications				
	PSMK 8.2.1	Precast concrete kerbing:				
		Edging E1:				
D.53		Radius up to 4m	m	5		
D.54		Radius over 4m up to 20m	m	5		
D.55		Radius over 20m and straight sections	m	20		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	PART SPEC PB	**BUILDING WORK**				
		Brickwork				
D.56		280mm thick cable trench filled cavity walls with 230mm wide x 2.8mm dia. galvanised brick force every course (on building foundation), both faces solid clay NFX-E stock brick	m²	20		
D.57		280mm thick external cavity walls with 250mm long x 3.15mm dia. galvanised butterfly ties at a minimum of 5 ties per square meter and 75mm wide x 2.8mm dia. galvanised brick force every fourth course (on top of building foundation walls to roof soffit height), internal face solid clay NFX-E stock brick and external face solid clay FBX-E face brick	m²	110		
D.58		230mm thick internal walls with 150mm long x 3.15mm dia. galvanised butterfly ties at a minimum of 5 ties per square meter and 75mm wide x 2.8mm dia. galvanised brick force every fourth course (on top of building foundation top/roof slab to roof soffit height), both faces solid clay NFX-E stock brick	m²	25		
		Air bricks				
D.59		Supply and build in external airbricks as specified	No	5		
		Window Sills				
D.60		Solid clay FBX-E face brick on edge on external wall external side of window including (DPC)	m	5		
		Plaster and Skim work				
D.61		10mm thick to both faces of internal walls of building walls	m²	130		
D.62		3mm thick to internal faces of building gypsum plaster board ceilings	m²	75		
		Floor screed				
D.63		Normal screed (25MPa strength)	m³	5		
		Waterproofing				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
D.64		Supply and place 375 micron DPC between 280mm thick brick cavity wall and 280mm thick brick infill cavity foundation wall, stepped one brick down from building floor slab top	m	60		
D.65		Supply and place 375 micron DPC between 230mm thick brick wall and top/roof slab, straight across bricks at building top/roof slab top	m	60		
D.66		Supply and place 375 micron DPC between 280mm thick brick wall and building windows and doors, horizontal and vertical to bricks around frame	m	10		
		Control, Interfacing and Movement Joints				
D.67		Vertical straight control 10mm wide formed v-joint consisting of two off 1.2mm thick x 30mm wide x 600mm long HDG mild steel concertina ties layed in each continious brick skin mortar bed either side of joint in brick work all at every third course and polysulphide sealant installed 105mm deep in brick work cut/formed vertical joint positions	m	5		
		Roof covering				
D.68		Supply and install 0.6mm IBR profile galvanized roof sheeting with a "Global-Duro" or similar approved coating of minimum total DFT of 50 micron (Loerie green colour)	m²	90		
		Rainwater outlets				
D.69		Supply and install and 125mm diameter heavy duty galvanised half-round gutters including galvanised jointing seems, with down pipe connections suitable for 80mm screwed and socketed galvanised downpipes and gutter brackets spaced at a maximum of 600mm	m	6		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
D.70		Supply and install 80mm diameter heavy duty galvanised screwed and socketed down pipes including galvanised holding brackets spaced at a maximum of 500mm suitable for use with 100mm dia galvanised rainwater outlets	m	10		
D.71		Supply and install 80mm diameter heavy duty galvanised screwed and socketed 45 degree bend suitable for use with 80mm dia. galvanised down pipes	No	2		
		Ceilings				
D.72		Supply and fix gypsum plaster board ceilings on brandering maximum 300mm centre to center spacing along brandering	m²	75		
D.73		Supply and fix 76mm gypsum cove cornice to ceilings and walls	m	60		
		Joinery				
		Supply and install doors:				
D.74		On building internal walls 900mm wide x 2100mm high Iroko solid hardwoord standard single outward opening door, ledged, braced, framed, five lever mortice lock with keys, door stop and stainless steel 100mm heavy duty 4.0mm thick flanged hinges assembly complete	No	2		
D.75		Supply and fix (67mm x 13mm) SA Pine standard Victorian style skirting to walls	m	60		
		Metalwork				
		Supply and install doors:				
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
D.76		On building external brick wall 1800mm wide x 2100mm high HDG mild steel high security outward opening double door with vented louvers lined with vermin proof mesh screens on the inside face and recessed frame with lugs coated with red oxide corrosion protection and painted with a electric orange colour top coat complete and including stainless steel components such as 100mm heavy duty 4.0mm thick flanged hinges, monkey tailed barrel bolt at top of door, barrel bolt at bottom of door, door locking barrel bolt and internal quick realese lever assembly complete	No	2		
		Supply and install windows:				
D.77		On building internal walls 1800mm wide x 1200mm high double glased fixed pane aluminium window and frame with dark bronze anodized corrosion protection coating complete with weather bar and tinted glass assembly complete.	No	1		
		Lintels				
D.78		Supply and install 150mm wide x 75mm deep x 2100mm long pre-stressed reinforced 40MPa concrete lintel in accordance with SANS 10400 K and complaint to SANS 1504 over doors	No	1		
		Painting				
D.79		Paint plastered wall faces of building with one filler coat, one under coat and two final coats of highly washable and stain resistant mid sheen water-based acrylic emulsion paint (antique petal grey colour) including mold and mildew-proof water based pure acrylate additive all suitable for interior	m²	130		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
D.80		Paint gypsum plaster board ceilings internal rooms with one primer coat, one under coat and two final coats of highly washable and stain resistant mid sheen water-based acrylic emulsion paint (off-white colour) including mold and mildew-proof water based pure acrylate additive all suitable for interior	m²	75		
D.81		Paint gypsum cove cornice internal faces of internal rooms with one primer coat, one under coat and two final coats of highly washable and stain resistant mid sheen water-based acrylic emulsion paint (off-white colour) including mold and mildew-proof water based pure acrylate additive all suitable for interior	m²	75		
		Roof Structure				
D.82		(a) Supply and install wooden roof structure complete as per specialist design	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
1	SITE CLEARANCE	
2	EARTHWORKS	
3	CONCRETE STRUCTURAL	
4	MEDIUM PRESSURE PIPELINES	
5	SUBBASE	
6	SEGMENTED PAVING	
7	KERBING AND CHANNELLING	
8	BUILDING WORK	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
E.0	SABS 1200 C	**SECTION : SITE CLEARANCE**				
		CLEAR SITE				
	PSC 8.2.1	Clear and grub:				
E.1		Site	m²	200		
E.2	PSC 8.2.7	Dismantle and remove pipelines (not encased in concrete), electricity transmission lines, cables, etc.	m	20		
E.3	PSC 8.2.7	Dismantle and remove pipelines encased in concrete	m	5		
E.4	8.2.10	Remove topsoil to nominal depth of 150 mm and stockpile	m³	5		
E.5	PSC 8.2.11	Remove topsoil to spoil site furnished by the contractor	m³	25		
E.6	PSC 8.2.13	Take down and re-erect existing fences	m	20		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 D : EARTHWORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 D	**EARTHWORKS**				
		as specified in SABS 1200 D and in the project specifications				
	PSD 8.3	SCHEDULED ITEMS				
	PSD 8.3.3	Restricted excavation:				
		Excavate for footings in all materials, and use for backfill or embankment, or dispose				
E.7		(a) Excavate for filter platform in all materials, and use for backfill or embankment, or dispose	m³	145		
		(b) Extra over item 8.3.3 above for:				
E.8		Intermediate excavation	m³	10		
E.9		Hard rock excavation	m³	1		
E.10		Boulder excavation Class A	m³	1		
E.11		Boulder excavation Class B	m³	1		
E.12	PSD 8.3.3 (c)	(c) Extra over item 8.3.3 (a) for hand excavation	m³	10		
E.13	PSD 8.3.4	Importing of materials from commercial sources and use for fill (clean sand, G7, compacted to 100% MOD)	m³	165		
	8.3.8.2	Dealing with services that are at risk because of the construction of earthworks:				
E.14		(a) Cables	No	1		
E.15		(c) Temporary protection of water rising main	Sum	1		
E.16	PSD 8.3.10	Topsoiling	m³	1		
E.17	PSD 8.3.16	Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor	m³	10		
E.18	PSD 8.3.19	Compaction of in-situ material to a depth of 300 mm	m²	200		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 G	**CONCRETE (STRUCTURAL)**				
		as specified in SABS 1200 G and in the project specifications				
	8.2	FORMWORK				
	8.2.1	Rough:				
E.19		Vertical plane	m²	20		
	8.2.2	Smooth:				
E.20		Platform floor slab	m²	10		
E.21	8.2.5	Narrow widths up to 25mm wide for chambers	m	60		
	8.3	REINFORCEMENT				
	PSG 8.3.1	Mild steel bars:				
E.22		Irrespective of diameter	t	0.10		
	PSG 8.3.1	High tenstile steel bars				
E.23		Irrespective of diameter	t	2		
	PSG 8.3.2	High-tensile welded mesh:				
E.24		Type reference 395 in sheets	m²	5		
E.25		Type reference 617 in sheets	m²	190		
	8.4	CONCRETE				
	8.4.2	Blinding layer in 15MPa/20mm concrete:				
		50 mm minimum thickness:				
E.26		Footing for brick walls	m²	50		
	8.4.3	Strength concrete :				
		15MPa/19mm				
E.27		Mass	m³	10		
		35MPa/19mm:				
E.28		Strip footing	m³	15		
E.29		Platform floor slab	m³	25		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
E.30		Outlet stand pipe slab	m³	2		
	8.4.4	Unformed surface finishes:				
E.31		(a) Wood floated finish (see PSG 7.1:	m²	50		
E.32		(b) Steel-floated finish (see PSG 7.2):	m²	190		
	8.5	JOINTS				
E.33		10 mm expansion joint, sealed with 25 mm x 10 mm approved polysulphide	m	90		
	PSG 8.11	Brickwork and Plaster work				
E.34		330mm thick cavity walls with Y12 reinforcing at 300mm center to center spacing	m²	65		
	PSG 8.16	Screeds:				
E.35		(a) 1:3 floor screeds with falls including v-joints to form panels and a smooth steel trowelled finish/power float finish to top:	m²	190		
	PSG 8.17	Cast in of pipes with or without puddle flanges:				
		(a) Up to 550mm nominal bore:				
E.36		(i) Through 300mm thick wall	No	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 L	**MEDIUM PRESSURE PIPELINES**				
		HDPE PIPES				
		as specified in SABS 1200 L and in the project specifications				
	PSL 8.2.1	Supply, lay and bed on bedding for flexible pipes, complete with couplings:				
		HDPE PE 100 PN 12.5 pipes continuously butt welded)SANS ISO 4427:1996)				
E.37		160 mm dia	m	60		
	8.2.2	Extra over item 8.2.1 for the supplying, laying and bedding of moulded HDPE fittings for same class as main pipe, continuously butt welded to pipe.				
		90 degree bends				
E.38		160 mm dia	No	2		
	PSL 8.2.11	Anchor blocks / thrust blocks and pedestals:				
		Concrete:				
E.39		Class 25MPa/19mm	m³	2		
		Formwork:				
E.40		Rough	m²	2		
		Reinforcement:				
E.41		Mild steel	t	0.10		
E.42		High tensile steel	t	0.10		
	PSL 8.2.18	Connection to existing main supply pipe:				
E.43		150mm dia	No	2		
TOTAL CARRIED FORWARD TO SUMMARY						

SECTION 1200 ME : SUBBASE

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SABS 1200 ME	**SUBBASE**				
		as specified in SABS 1200 ME and in the project specifications				
	PSME 8.3.3	Construct the subbase course/shoulders/gravel wearing course with material from commercial sources:				
E.44		Construct the G5 subbase course 150mm thick compacted to 95% MDD with material from commercial sources	m³	30		
	PSME 8.3.11	Treatment of subbase with:				
E.45		(a) Weed killer	m²	175		
E.46		(b) Insecticide	m²	175		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
1	SITE CLEARANCE	
2	EARTHWORKS	
3	CONCRETE (STRUCTURAL)	
4	MEDIUM PRESSURE PIPELINES	
5	SUBBASE	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
F		**GENERAL**				
		GENERAL REQUIREMENTS AND CONDITIONS				
		Allow for all costs and expenses in connection with the following:-				
F.1		Providing Performance Security (Performance Guarantee) for entire scope of works	Sum	1		
F.2		Providing Insurances	Sum	1		
F.3		Design of the Works and submission of Contractor's Documents	Sum	1		
F.4		Site security	Sum	1		
F.5		Establishment on site	Sum	1		
F.6		Other General expenses incurred in complying with the requirements of the Contract not included above. (Specify):	Sum	1		
F.7		Chairing and minuting a HAZOP meeting for full scope of works	Sum	1		
F.8		Site security	Sum	1		
F.9		General expenses incurred in complying with the requirements of the Tender Data, not included above	Sum	1		
F.10		General expenses incurred in complying with the requirements of the Contract Data, not included above	Sum	1		
F.11		Allow for all costs and expenses to conduct a detailed dimensional survey of the existing civil infrastructure prior to finalizing the design of M&E Equipment	Sum	1		
F.12		Other General expenses incurred in complying with the requirements of the Contract not included above. (Specify):	Sum	1		
F.13		1)	Sum	1		
F.14		2)	Sum	1		
F.15		3)	Sum	1		
F.16		4)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

PRESSURE MEDIA FILTERS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
		PRESSURE MEDIA FILTERS				
		Allow for all cost and expenses in connection with the following:				
F.17		Design, submission and approval of drawings for the complete pressure media filtration plant including relocated filters	Sum	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
F.18		Pressure Filter system complete: Filters 23-28	No	6		
F.19		Filter Media complete: Filters 1-28	No	28		
F.20		Filter gravel complete: Filters 1-28	No	28		
F.21		All fasteners, brackets and additional equipment required to complete the above items	Sum	1		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
F.22		Pressure Filter system complete: Filters 23-28	No	6		
F.23		Filter Media complete: Filters 1-28	No	28		
F.24		Filter gravel complete: Filters 1-28	No	28		
F.25		All fasteners, brackets and additional equipment required to complete the above items	Sum	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
F.26		Allow for the sequential disconnection of of the existing 22 pressure filters including relocation and recommissioning of the same at the location as indicated on the drawings. Existing filter bank to be kept operational while new filter bank and relocated filters are installed. Both the remaining existingfilters and new and relocated filter banks to be kept operational until new filter bank is complete. Allow for all temporary works. No more than 4 filters may be out of operation at any time.	Sum	1		
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):				
F.27		a) Condition assessment of internals of each pressure filter including a detailed report to the Engineer highlighted the repairs required.	Sum	1		
F.28		b)	Sum	1		
F.29		c)	Sum	1		
		Provisional Sums				
F.30		Provisional Sum for repairs to existing filter underdrains and top distributors	Prov Sum	1	250,000.00	250,000.00
F.31		Markup for overhead and profits on Prov Sum above.	%	250,000.00		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		CENTRIFUGAL PUMPING EQUIPMENT				
		Allow for all cost and expenses in connection with the following:				
F.32		Design, submission and approval of drawings including pump curves overlayed on system curves indicating duty pounts.	Sum	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
F.33		Centrifugal Pumps: Filter Feed pump system complete 050P001 & 050P002	No	2		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
F.34		Centrifugal Pumps: Filter Feed pump system complete 050P001 & 050P002	No	2		
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):				
F.35		a)	Sum	1		
F.36		b)	Sum	1		
F.37		c)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		PIPEWORK AND VALVES				
		PIPEWORK, FITTINGS AND VALVES				
		Allow for all cost and expenses in connection with the following:				
F.38		Design, submission and approval of drawings	Sum	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
		Straight pipe cut to size to make up specials				
F.39		dia. 80 mm SS304	m	21		
F.40		dia. 100 mm SS304	m	202		
F.41		dia. 150 mm SS304	m	48		
F.42		dia. 200 mm SS304	m	85		
F.43		dia. 250 mm SS304	m	52		
F.44		dia. 300 mm SS304	m	40		
F.45		dia. 350 mm SS304	m	28		
F.46		dia. 400 mm SS304	m	12		
F.47		dia. 450 mm SS304	m	12		
		Flanges, welded onto pipes (PN10) - including nuts, bolts, washers and gaskets required				
F.48		dia. 80 mm SS304	No	56		
F.49		dia. 100 mm SS304	No	198		
F.50		dia. 150 mm SS304	No	22		
F.51		dia. 200 mm SS304	No	24		
F.52		dia. 250 mm SS304	No	24		
F.53		dia. 300 mm SS304	No	26		
F.54		dia. 350 mm SS304	No	16		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
F.55		dia. 400 mm SS304	No	6		
F.56		dia. 450 mm SS304	No	2		
		Long Barrel Flange Adaptors (SS304, PN 10)				
F.57		dia. 80 mm	No	2		
F.58		dia. 100 mm	No	56		
F.59		dia. 150 mm	No	6		
F.60		dia. 200 mm	No	4		
F.61		dia. 250 mm	No	8		
F.62		dia. 300 mm	No	3		
		Puddle flanges, welded onto pipes				
F.63		dia. 80 mm SS304	No	1		
F.64		dia. 100 mm SS304	No	2		
F.65		dia. 150 mm SS304	No	2		
F.66		dia. 200 mm SS304	No	2		
F.67		dia. 250 mm SS304	No	2		
F.68		dia. 300 mm SS304	No	6		
F.69		dia. 350 mm SS304	No	3		
F.70		dia. 400 mm SS304	No	1		
F.71		dia. 450 mm SS304	No	1		
		90˚ medium radius bends (Excluding flanges and welding onto other pipes/fittings, but including all welds required to manufacture the bend.)				
F.72		dia. 80 mm SS304	No	28		
F.73		dia. 100 mm SS304	No	56		
F.74		dia. 150 mm SS304	No	28		
F.75		dia. 200 mm SS304	No	8		
F.76		dia. 250 mm SS304	No	12		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
F.77		dia. 300 mm SS304	No	16		
F.78		dia. 350 mm SS304	No	24		
F.79		dia. 400 mm SS304	No	2		
		45˚ medium radius bends (Excluding flanges and welding onto other pipes/fittings, but including all welds required to manufacture the bend.)				
F.80		dia. 80 mm SS304	No	2		
F.81		dia. 100 mm SS304	No	2		
F.82		dia. 150 mm SS304	No	2		
F.83		dia. 200 mm SS304	No	2		
F.84		dia. 250 mm SS304	No	2		
F.85		dia. 300 mm SS304	No	2		
F.86		dia. 350 mm SS304	No	2		
		Tee Pieces (Excluding flanges and welding onto other pipes/fittings, but including all welds required to manufacture the bend.)				
F.87		dia. 80 mm SS304	No	12		
F.88		dia. 100 mm SS304	No	30		
F.89		dia. 250 x 100 mm SS304	No	88		
F.90		dia. 150 mm SS304	No	12		
F.91		dia. 200 mm SS304	No	16		
F.92		dia. 250 mm SS304	No	18		
F.93		dia. 300 mm SS304	No	12		
		Sweep Tee Pieces (Excluding flanges and welding onto other pipes/fittings, but including all welds required to manufacture the bend.)				
F.94		dia. 100 mm SS304	No	1		
F.95		dia. 150 mm SS304	No	1		
F.96		dia. 250 mm SS304	No	2		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
F.97		dia. 300 mm SS304	No	1		
		Flanged rubber bellows				
F.98		dia. 250 mm SS304	No	2		
F.99		dia. 300 mm SS304	No	2		
		Welding of pipes at joints				
F.100		dia. 80 mm SS304	No	10		
F.101		dia. 100 mm SS304	No	220		
F.102		dia. 150 mm SS304	No	40		
F.103		dia. 200 mm SS304	No	50		
F.104		dia. 250 mm SS304	No	60		
F.105		dia. 300 mm SS304	No	40		
F.106		dia. 350 mm SS304	No	5		
		Concentric Reducers to any smaller size (length = largest dia.) - Excluding flanges and welding onto other pipes/fittings				
F.107		dia. 80 mm to dia.50mm SS304	No	2		
F.108		dia. 150 mm to dia. 100 mm SS304	No	6		
F.109		dia. 200mm to dia. 100 mm SS304	No	2		
F.110		dia. 200mm to dia. 150 mm SS304	No	4		
F.111		dia. 300mm to dia. 250 mm SS304	No	4		
F.112		dia. 350 mm to dia. 300 mm SS304	No	4		
		Eccentric Reducers to any smaller size (length = largest dia.) - Excluding flanges and welding onto other pipes/fittings				
F.113		dia. 80 mm to any smaller size SS304	No	2		
F.114		dia. 100 mm to any smaller size SS304	No	1		
F.115		dia. 150 mm to any smaller size SS304	No	1		
F.116		dia. 200 mm to any smaller size SS304	No	6		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
F.117		dia. 400 mm to any smaller size SS304	No	2		
		Pipe supports and walkways				
F.118		All pipe supports, fixing material and walkways for the Filter Feed pump system complete 50P01 and 50P02	Sum	1		
F.119		All pipe supports, fixing material complete for the pressure media filters including all feed pipework, backwash pipework and filtrate pipework	Sum	1		
		Valves				
		RSV Gate Valves (Manual)				
F.120		DN150	No	3		
F.121		DN200	No	3		
		Butterfly Valves (Manual)- wafer type				
F.122		DN65	No	4		
F.123		DN80	No	28		
F.124		DN100	No	84		
F.125		DN150	No	6		
		Butterfly Valves (Manual)- double flanged				
F.126		DN200	No	4		
F.127		DN250	No	6		
F.128		DN300	No	6		
F.129		DN350	No	6		
F.130		DN400	No	2		
		Manual Pressure Regulating Valves				
F.131		DN80 Manual Globe Valve	No	4		
F.132		DN300 V-port knife gate valve	No	1		
		uPVC Ball Valves (Manual)				
F.133		DN63	No	6		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
		Check Valves				
F.134		DN250 swing check valve with lever arm	No	2		
F.135		DN300 swing check valve with lever arm	No	1		
		Air Release Valves				
F.136		DN50 Air Release Valve	No	3		
F.137		DN100 Air Release Valve	No	1		
		Pressure Relief Valves				
F.138		Pressure Relief Valve (Release 200m3/hr @ 1.1bar, setting at 1 bar)	No	3		
		Orifice Plates				
F.139		DN100, 3mm thick SS316, with 30mm openings (openings dia. to be confirmed by Engineer prior to procurement).	No	28		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
F.140		All pipework and valve items listed above.	Sum	1		
		Fire Protection Equipment				
F.141		Supply and install Standard Type Fire Hose Reel with a wall-mounted bracket, hose guide, nozzle, pressure guage and 30m hose. Fire hose real to be SABS approved according to SANS 543 and SANS 1086.	No.	2		
F.142		Supply and install 4.5kg DCP Fire Extinguishers to conform to the minimum fire ratings as specified in SANS 1910:2009. Including wooden backing and signage.	No.	6		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):				
F.143		a)	Sum	1		
F.144		b)	Sum	1		
F.145		c)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		INSTRUMENTATION				
		Note that rates for instrumentation shall include sensors, transmitters, programming and calibration.				
		Allow for all cost and expenses in connection with the following:				
F.146		Design, submission and approval of drawings	Sum	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
		Turbidity Meters				
F.147		Turbidity meter and transmitter on filtrate line	No	1		
		Pressure Gauges (Including pressure indicators pipework 304L and 304L three piece ball valves for isolation and air bleed):				
F.148		Pressure Gauge Assemblies	No	12		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
		Turbidity Meters				
F.149		Turbidity meter and transmitter on filtrate line	No	1		
		Pressure Gauges (Including pressure indicators pipework 304L and 304L three piece ball valves for isolation and air bleed):				
F.150		Pressure Gauge Assemblies	No	12		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):				
F.151		a)	Sum	1		
F.152		b)	Sum	1		
F.153		c)	Sum	1		
F.154		d)	Sum	1		
F.155		e)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		HVAC AND LIFTING EQUIPMENT				
		Allow for all cost and expenses in connection with the following:				
F.156		Design, submission and approval of drawings	Sum	1		
		Allow for all costs and expenses in connection with the design, manufacture, quality management, painting, testing, supply, delivery, offloading and storage of the following materials and equipment:				
F.157		Crawl beam and manual block and tackle system to lift pump and baseframe assembly of filter in filter feed pump station complete	No	1		
F.158		All fasteners, brackets and additional equipment required to complete the above items	Sum	1		
F.159		Forced Ventilation and louvre system for the filter feed pumpstation building: Allow 10 air changes per hour including pre-filtration and HDG ducting down to pump level	Sum	1		
		Allow for all cost and expenses in connection with the Site Installation, Testing, Commissioning and upholding during the Trial Operation Period and Defects Notification Period of the following:				
F.160		Crawl beam and manual block and tackle system to lift pump and baseframe assembly of filter in filter feed pump station complete	No	6		
F.161		All fasteners, brackets and additional equipment required to complete the above items	Sum	1		
F.162		Forced Ventilation and louvre system for the filter feed pumpstation building: Allow 10 air changes per hour including pre-filtration and HDG ducting down to pump level	Sum	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
BROUGHT FORWARD						
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant. (Specify):				
F.163		a)	Sum	1		
F.164		b)	Sum	1		
F.165		c)	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
		SUNDRIES				
		Allow for all costs and expenses in connection with the following:				
F.166		Providing "as built" drawings in the latest AutoCAD version as well as 3 additional hard copies.	Item	1		
F.167		Providing 2 draft copies of the Installation, Operation and Maintenance Manual prior to commissioning of the Works.	Item	1		
F.168		Providing 6 final copies of the Installation, Operation and Maintenance Manual prior to the issue of the Taking -Over Certificate.	Item	1		
F.169		Operating Instructions and Signage, as specified.	Item	1		
F.170		Inspection, Tests, etc. of all equipment outside the Western Cape	Item	1		
F.171		Provision of all Test Certificates and Certificate of Compliance in terms of the Code of Practice for Wiring of Premises.	Item	1		
F.172		Checking, starting up, testing and commissioning of the complete Works.	Item	1		
F.173		Operational Acceptance Testing of the complete works as well as recording the test result and presenting it to the Engineer for approval.	Item	1		
F.174		Operational and Maintenance Training (allow for 3 full days).	Item	1		
F.175		Trial Operation Period Obligations.	Item	1		
F.176		Maintaining the Works during the Defects Notification Period.	Item	1		
F.177		Maintenance inspection every 3, 6, 9 and 12 months after take over. Provide a short report to Engineer.	Item	1		
F.178		Provision of a Contract Nameboard at the entrance of the Works	Item	1		
TOTAL CARRIED FORWARD						

SUNDRIES

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
F.179		Provision of a comprehensive technical write-up for each system and equipment after completion of the Contractor's design confirming that the equipment complies to the various specifications.	Item	1		
TOTAL CARRIED FORWARD TO SUMMARY						

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT R
1	GENERAL	
2	PRESSURE MEDIA FILTERS	
3	CENTRIFUGAL PUMPING EQUIPMENT	
4	PIPEWORK AND VALVES	
5	INSTRUMENTATION	
6	HVAC AND LIFTING EQUIPMENT	
7	SUNDRIES	
TOTAL CARRIED FORWARD TO SUMMARY OF SCHEDULES		

SUMMARY OF SCHEDULES

SCHEDULE	DESCRIPTION	AMOUNTR
1	SCHEDULE A: PRELIMINARY AND GENERAL	
2	SCHEDULE B: PIPEWORK	
3	SCHEDULE C: WTW INLET CHANNEL	
4	SCHEDULE D: TRANSFER PUMP STATION	
5	SCHEDULE E: PRESSSURE FILTERS PLATFORM	
6	SCHEDULE F: MECHANICAL	
TOTAL		

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
G	BULK ELECTRICAL SUPPLY							
	Supply and install							
	Upgrade Work							
G.1	Supply Authority coordination for switching and necessary notices	Sum						
G.2	New LV connections onto minisub for new CB, complete with suitably rated tails (main supply cable connection measured elsewhere)	Sum						
G.3	New 150A LV CB, mounted in existing minisub, with updated LV labels	Sum						
G.4	Minisub plinth renovation and neatening work	Sum						
Total Carried Forward To Summary								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	MOTOR CONTROL CENTRES (MCCs)							
	Supply and install							
G.5	New indoor MCC for Filter Feed PS - complete with associated starters	Each	1					
G.6	New PLC and HMI hardware, complete with network switch	Each	1					
G.7	New PLC and HMI - software licensing, configuration and programming	Each	1					
	Total Carried Forward To Summary							

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	INSTRUMENTATION							
	Supply and install							
	Pressure							
	Pressure Sensors							
G.8	Pump Delivery	Each	2					
G.9	Common Delivery	Each	1					
G.10	Filters - Upstream/Downstream	Each	2					
	Level							
	Ultrasonic Level Sensor							
G.11	Suction control sump	Each	1					
	Float Level Switches							
G.12	Suction control sump	Each	2					
	Flow							
	Electromagnetic Flow Meter - 0 x DN full-bore type							
G.13	Pumps Common Delivery	Each	1					
G.14	Filter Backwash Lines	Each	4					
	Limit switches							
G.15	Pumps Non-return arms	Each	2					
Total Carried Forward To Summary								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	CABLES							
	Supply and install							
	Power Supply Cable From Minisub To MCC:							
G.16	Main MCC: 70mm2 x 4 Cu SWA	m	100					
G.17	Main MCC: 70mm2 BCEC	m	100					
	Power Supply Cable From Main MCC To:							
G.18	Extraction fans: 1.5mm2 x 3 Cu Cabtyre	m	40					
G.19	Local DB: 6mm2 x 3 Cu + 6mm2 BCEC	m	10					
G.20	Small lighting and power - refer section 9 below	m	0					
	Instrumentation Controller Supply Cables from Main MCC: 2.5mm2 x 3 Cu							
G.21	Common Control Sump Ultrasonic Controller	m	25					
G.22	Filter Feed Pump Common Discharge Flow Meter	m	15					
G.23	Filter Backwash Line Flow Meters	m	400					
G.24	Turbidity Analytical Sensor	m	100					
	Motor Cables							
G.25	Main Pumps: 25mm2 x 4 Cu	m	50					
G.26	Pump Motor Cooling Fans: 2.5mm2 x 4 Cu	m	50					
	Control Cables							
	Float Level Switches: 1.5mm2 x 7							
G.27	Common control sump	m	25					
	Local Control Stations: 1.5mm2 x 7							
G.28	Main pumps	m	50					
G.29	Pump Motor Cooling Fans	m	50					
	Pump overheat: 1.5mm2 x 3							
G.30	Main pumps	m	50					
	Limit switches: 1.5mm2 x 3							
G.31	Main pumps	m	50					
	Instrumentation Cables							
	Pressure Sensor: 1.5TPx2 individually and overall screened, armoured							
G.32	Delivery - common and pumps	m	75					
G.33	Filter Upstream	m	100					
G.34	Filter Downstream	m	100					
	Flow Meter: 1.5TPx2 screened							
G.35	Water common	m	15					
	Flow Meter: 1.5TPx2 individually and overall screened, armoured							
G.36	Filter Backwash Lines	m	400					
	Ultrasonic level sensor: 1.5TPx2 screened and armoured							
G.37	Common control sump	m	25					
G.38	Turbidity Analytical Sensor: 1.5TPx2 individually and overall screened, armoured	m	100					
Total Carried Forward To Summary								

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	CONNECTIONS							
	Power / Motor Cables							
G.39	70 x 4	Each	2					
G.40	25 x 4	Each	4					
G.41	1.5/2.5	Each	12					
	Earth cables							
G.42	70	Each	2					
G.43	6/4/2.5	Each	8					
	Control cables							
G.44	1.5	Each	12					
	Instrumentation cables							
G.45	1.5 x 1 TP	Each	12					
	Total Carried Forward To Summary							

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	GENERAL ELECTRICAL WORK, CABLE INSTALLATION AND ANCILLARIES							
	Supply, install and connect							
	Local Control Station: Floor-standing, Green Start and Red Mushroom E-Stop							
G.46	Main Pumps	Each	2					
	Local E-Stop Station: Floor-standing, Red Mushroom E-Stop							
G.47	Pump Motor Cooling Fans	Each	2					
	IP68 junction boxes							
G.48	For level at sump	Each	2					
G.49	Filter Area	Each	6					
	Site Display and Housing Boxes, complete with stand, mountings, hood, display, terminations, internal supplies and coating/protection against sun damage - 3CR12							
G.50	Control Sump Ultrasonic Display	Each	1					
G.51	Common Discharge Flow Meter	Each	1					
G.52	Filter Backwash Flow Meters	Each	4					
	Wet-Sump Work:							
G.53	Stainless steel mounting brackets for instrumentation	Each	1					
	Cable Tray HDG							
	Supply and install, complete with mounting, spacing and suspension ancillaries							
G.54	100mm	m	50					
G.55	300mm	m	30					
G.56	Bosal for final sections	m	45					
G.57	Extraction fan temperature controllers and lockable isolators	Each	2					
G.58	Ancillaries such as draw-boxes, spacers, expanding foam, etc. for a fully compliant and neat installation	Sum	1					
G.59	36000BTU Industrial Inverter split-aircon, complete with ducting, mounting power supply (MCC Room) and protective cage	Each	1					
	Total Carried Forward To Summary							

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	EARTHING							
	Supply, install and connect							
G.60	Issuing of COC - In compliance to latest SANS 10142-1	Each	1					
G.61	New MCC earth mat	Sum	1					
G.62	General bonding and earthing of equipment and relevant structures, including all ancillaries required	Sum	1					
	Total Carried Forward To Summary							

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	EXCAVATION							
	New LV (750mm)							
G.63	Pickable soil - by hand	m	160					
G.64	Intermediate soil	m³	20					
G.65	Hard rock	m³					Rate Only	
G.66	Bedding and disposal	m³	40					
G.67	Danger tape	m	320					
G.68	Concrete paver blocks for additional cable protection	Each	20					
G.69	Existing services underground detection, by means of scanning	m	80					
G.70	Gravel road crossing, with 3 x 160Ø sleeves and restoration to original condition	Each	1					
	Total Carried Forward To Summary							

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	BUILING LIGHTING AND POWER							
	Standard cost per outlet point for the complete supply and installation of recessed outlets including all required material and labour (bosal conduit, conductors, draw-wire, terminations etc…)							
	Filter Feed PS							
G.71	Local DB	Each	1					
	Switched socket outlets - IP67							
G.72	Industrial 16A (2-way, 1400 AFFL)	Each	1					
G.73	Isolators (2-pole)	Each	3					
G.74	Isolators (3-pole)	Each	0					
	Light Switches							
G.75	Industrial one way - indoor	Each	2					
G.76	Industrial one way - outdoor	Each	1					
	Luminaires							
G.77	Building Indoor: 40W LED	Each	12					
G.78	Electrical Area Outdoor: 40W LED	Each	5					
G.79	Building Floodlight: 60W LED	Each	1					
G.80	Photocell	Each	1					
	Outlet points							
G.81	Socket outlets	Each	4					
G.82	Switches	Each	3					
G.83	Lights	Each	19					
G.84	Any other expenses deemed to be incurred in complying with the full requirements of the Scope of Works	Sum	1					
	Total Carried Forward To Summary							

LANGEBERG MUNICIPALITY
CONTRACT NO: T13/2026
UPGRADING OF BONNIEVALE WATER TREATMENT WORKS

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT (RAND)
1	BULK ELECTRICAL SUPPLY	.....
2	MOTOR CONTROL CENTRES (MCCs)	.....
3	INSTRUMENTATION	.....
4	CABLES	.....
5	CONNECTIONS	.....
6	GENERAL ELECTRICAL WORK, CABLE INSTALLATION AND ANCILLARIES	.....
7	EARTHING	.....
8	EXCAVATION	.....
9	BUILDING LIGHTING AND POWER	.....
Total Carried Forward To Summary Of Schedules		

LANGEBERG MUNICIPALITY
CONTRACT NO: T13/2026
UPGRADING OF BONNIEVALE WATER TREATMENT WORKS

SCADA UPGRADES

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
H	SCADA UPGRADES							
	Supply, install and connect							
H.1	New pump station integration into existing SCADA platform	PC Sum	1	100,000.00		100,000.00	100,000	00
Total Carried Forward To Summary								

LANGEBERG MUNICIPALITY
CONTRACT NO: T13/2026
UPGRADING OF BONNIEVALE WATER TREATMENT WORKS

ITEM NO	DESCRIPTION	UNIT	QTY	MATERIAL RATE	LABOUR RATE	TOTAL RATE	AMOUNT	
							R	c
	TELEMETRY UPGRADES							
H.2	Expansion of existing telemetry outstation, to incorporate new pump station signals	PC Sum	1	100,000.00		100,000.00	100,000	00
H.3	Network hardware and software components for integration between the two adjacent pump stations	PC Sum	1	100,000.00		100,000.00	100,000	00
H.4	Any other expenses deemed to be incurred in complying with the full requirements of the Scope of Works	Sum	1					
	Total Carried Forward To Summary							

LANGEBERG MUNICIPALITY
CONTRACT NO: T13/2026
UPGRADING OF BONNIEVALE WATER TREATMENT WORKS

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT (RAND)
1	SCADA UPGRADES	.....
2	TELEMETRY UPGRADES	.....
Total Carried Forward To Summary Of Schedules		

LANGEBERG MUNICIPALITY

TENDER NO. 13/2026

UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1

A: SUMMARY OF SCHEDULE(S) OF QUANTITIES

A	DESCRIPTION	TENDERED AMOUNT
	SCHEDULE A: PRELIMINARY AND GENERAL	R
	SCHEDULE B: PIPEWORK	R
	SCHEDULE C: WTW INLET CHANNEL	R
	SCHEDULE D: TRANSFER PUMP STATION	R
	SCHEDULE E: PRESSURE FILTERS PLATFORM	R
	SCHEDULE F: MECHANICAL	R
	SCHEDULE G: ELECTRICAL	R

B	TOTAL OF SCHEDULE(S)	R

C	CONTINGENCIES (10**%** of TOTAL B above)	R

The sum provided is under the direct control of the Engineer and may be partially or totally excluded

D	**TOTAL (C+D)**	**R**

E	TOTAL VALUE ADDED TAX (15%) ON (D) ABOVE	R

F	**CONTRACT PRICE CARRIED FORWARD TO C1.1 FORM OF OFFER (D+E)**	**R**

I/We, the undersigned, do hereby declare that these are the properly priced Bill / Schedules of Quantities forming part of this Contract Document containing Pages in consecutive order upon which my/our Tender for
Contract No.: 13/2026 – UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1 has been based.

My/our total Contract Price for these work and above items (Total **I**) is (in words):

……

……

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

DECLARATION (In respect of completeness of Tender)

Langeberg Municipality
28 Main Street,
Ashton

I/we, the undersigned, do hereby declare that these are the properly priced Bills of Quantities forming Part C2.2 of this Contract Document containing 349 pages plus the BOQ plus the Health and Safety document pages in consecutive order upon which my/our tender for **TENDER NO. 13/2026 – UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1** has been based. If I/we have submitted a printed version of the Bills of Quantities, I/we warrant that no amendments have been made to it from the original, other than amendments issued in any Addenda in terms of Clause C.3.2 in Part T1.2 Tender Data.

SIGNED ON BEHALF OF TENDERER:	
NAME, SURNAME & POSITION	
DATE	

LANGEBERG MUNICIPALITY

TENDER NO. 13/2026

UPGRADE AND REFURBISHMENT OF BONNIEVALE WTW PHASE 1

PART C3: SCOPE OF WORKS

CONTENTS

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C3.4	CONSTRUCTION	141
C3.5	MANAGEMENT	169
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C3.1 DESCRIPTION OF THE WORKS

C3.0 DEFINITIONS

For the purposes of interpretation, the words "Employer's Agent" and "Engineer" shall have the same meaning in this project specification.

EMPLOYER'S OBJECTIVES

This project forms part of a larger upgrade of the Bonnievale Water Treatment Works (WTW), which will in the future increase the capacity of the works. For this phase, the Employer's objectives are to keep/boost the capacity of the plant by increasing the filtration capacity by installing new additional pressure filters and altering the pipework between filters so that one filter can be backwashed at a time without taking the others out of operation.

OVERVIEW OF THE WORKS

The scope includes (but is not limited to):

Civil and Structural Works:

- Relocation of existing pressure filters, installation of additional pressure filters and alteration of pipework between filters so that one filter can be backwashed at a time.
- Construction of new interconnecting pipework.
- Construct a new transfer pump station.

Mechanical and Electrical Works:

- Supply and installation of various pumps and blowers for the WTW
- Supply and installation of piping valves and other associated infrastructure between the various process stages.
- Supply and installation of pressure filters.
- Control instrumentation, cabling, MCC and other electrical items.
- 28-Day trial and operation period included in the time for completion.

This description of the works is not necessarily complete and shall not limit the work to be carried out by the contractor under this contract.
The specifications for each component of the scope of work are detailed below and itemised in the pricing schedule accordingly.

EXTENT OF THE WORKS

The site is located within the existing Bonnievale WTW site located on Erf 854. The boundary of this erf is considered the boundary of the site.

SERVICES

The exact location of all utility services is unknown and the Contractor will at all times be required to be in contact with the relevant service providers. The positions and relocations of services shown on the drawings are based on the information available at the time of bid and the Contractor is required to exercise extreme caution whilst undertaking construction activities until the exact positions of all services in the vicinity have been readily established. It is expected

however that in some cases final decisions will have to be made on site as to the protection of services.

The Contractor shall liaise with the Langeberg Municipality and shall ensure that all required Wayleaves have been obtained before the commencement of works.

ACCOMMODATION OF TRAFFIC

The Works are to be carried out in areas with pedestrian and vehicular traffic. The barricading, lighting and traffic control on Site shall be carried out in strict compliance with these Specifications. Furthermore, the Contractor shall ensure that pedestrians have free access past the Works without having to walk on trafficked roadways and shall make every effort necessary to ensure that his construction activities cause as little inconvenience and danger to the public as possible.

The Contractor shall provide safe and unrestricted flow of residents, vehicles and pedestrians at all times during the construction period. Wayleaves and necessary notifications shall be the responsibility of the Contractor.

LOCATION OF THE WORKS

The coordinates are summarised below:

Description	Coordinates		Elevation
	Latitude	Longitude	Above mean sea level
Bonnievale WTW	33°56'11.01"S	20°05'09.60"E	126m

It must be noted that the only access route to site is a gravel access road from the Main Street in Bonnievale and extreme caution must be taken by all parties approaching and leaving the site as people (adults and children) and domestic animals are regularly encountered along the route.

Refer section C4 for more information.

TEMPORARY WORKS

The Contractor shall be responsible for designing and providing any and all temporary works required for and during construction. Such works and the positioning thereof are to be designed and approved by the Contractor's suitably qualified and appointed professional before erection and operation on site.

Such temporary works shall be removed upon completion of the Works and the site of such temporary works re-instated to a condition acceptable to not pose a Health and Safety or/and Environmental risk.

The expected normal temporary works for the construction works as a minimum, and not limited to, which may be encountered will be shoring of trenches, underpinning and supporting existing structures and infrastructure, supporting and erecting of formwork, scaffolding, safeguarding of bends and thrust blocks, demolition work, etc. will be required to facilitate construction.

Further temporary works are described in Part 3.9 Temporary Works

Furthermore, special note should be taken of the following:

C3.1.7.1 Traffic and Site Access

The Contractor will have to make allowances in the tendered rates for working in conjunction with normal traffic during construction and temporary access as this is a brownfield site and granted access to the Employer or persons appointed by the Employer who undertaking maintenance and operation of the works within or adjoining to the site during construction will be required.

Furthermore, the Contractor will not be financially compensated in time in the event that a particular access is closed due to e.g., planned maintenance of roads, other foreseeable closures etc. In such an event the Contractor shall arrange for alternative access to the Works at assisted expense by the Employer only for the actual cost of plant and material if applicable and not considered double dipping.

C3.1.7.2 Wayleaves (as applicable)

Although the Engineer will provide drawings of existing services, the Contractor shall be responsible for liaising with the relevant service authorities and shall obtain his own wayleaves / approvals before commencing construction.

C3.1.7.3 Security

The Contractor will have to make allowances in the tendered rates for the provision of security personnel as he deems required for the Construction duration. It is strongly advisable that security be provided for full the full 24-hour day as no claims will be entertained by the Employer for additional security or loss of any kind.

The type of security shall be determined by the contractor in line with the associated risks anticipated. This shall take into account the position of the site camp.

C3.1.7.4 Temporary Fencing of Trenches and Excavations

Temporary fencing of trenches and excavations must be provided where there are open trenches and excavations, including within the boundary of the WTW site. The trenches and excavations are to be barricaded all around (360 degrees) 24 hours a day, 7 days a week including working, non-working and special non-working days. No person must be able to enter an open trench or excavation at any time without controlled access.

The temporary fencing shall consist of 1.8m high Bonnox close mesh range fencing or similar approved, unless specified otherwise in the contract under allowed for payment items. The temporary fencing shall be firmly secured to fencing poles to prevent access and should not be affected by the weather. The Contractor shall make provision for access to the trenches and excavations for his/her personnel and plant during the required working hours and times with access locked at the close of each day prior to leaving site.

No additional payment will be made to repair and to replace damaged or stolen fencing. It is the Contractor’s responsibility to provide security, and secure and maintain the temporary fencing.

The Engineer shall instruct the Contractor to backfill any trench or excavation which has not been temporarily fenced as per the specifications or the above. The subsequent backfilling and reopening of the trench shall be for the Contractor's own account.

C3.1.7.5 Other Services

Extensive allowances have been allowed for verifying services, and therefore the Contractor shall ensure that the position of all existing services which could be affected during and by the construction works has been verified before construction commences.

C3.1.7.6 Survey Beacons and Benchmarks

The Contractor shall be responsible for the preservation of all land survey, erf or other pegs, benchmarks, and beacons. If damage or disturbance of any such pegs or beacons is caused by the operations of the Contractor, or their subcontractors, the pegs are to be replaced by a Registered Land Surveyor at the cost of the Contractor. Information regarding the position of all such pegs will be made available to the Contractors by the Engineer.

The Contractor is to ensure that no spoil is placed over erf pegs or benchmarks and that these are adequately protected for the full duration of the Contract.

Where disturbances of boundary pegs are unavoidable due to excavation or other operations adjacent to the pegs, the Contractor shall advise the Engineer or his Representative immediately, and agreement is to be reached that the disturbance of the peg is unavoidable and a strict record of such disturbed pegs is to be kept. Such pegs are to be replaced by a Registered Land Surveyor as described above and the Contractor is to submit proof of the cost of replacement of pegs. The Contractor will be reimbursed on a basis pro-rata to the total cost of peg replacement determined on completion of the Works and shall distribute accordingly to the Sub-Contractor if needed.

The Contactor shall arrange with a surveyor to confirm if the Engineers benchmarks provided on the drawings are correct. In the event that benchmarks are not shown on the drawings or not located on site the Contractor shall arrange with a surveyor, at the Contractors expense, for the placement of benchmarks.

C3.1.7.7 Protection of the Existing Works

The Contractors shall ensure that the position of all existing services which could be affected during and by the construction works has been verified before construction commences.

Furthermore, the Contractors shall take all necessary steps to protect any and all existing works and infrastructure whatsoever against damage which may arise as a result of his operations on Site. The Contractors shall bear the cost of the repair of damage to any service, the possible existence of which could reasonably have been ascertained by him in good time.

For underground services, again it is reiterated that the Contractors shall ascertain the location of existing services before commencing any section of the works and shall exercise the greatest care when working in the vicinity of such services.

The Contractors will also be responsible for contacting the various service providers, arranging a meeting and verifying all known as well as possible unknown services which could be reasonably inferred on the site.

Where the Contractor is responsible for damage for which repairs have to be carried out by the Employer or an outside Authority, the costs of these repairs will be recovered by means of a deduction from the Contractor's Interim Payment Certificate. The Employer will attend to the payment of monies due to outside authorities, should the Contractor not make direct payment, to the outside authorities, timeously.

C3.1.7.8 Tidying up of the Works

The Contractor shall take note that progressive and systematic finishing and tidying will form an essential part of this contract. On no account shall spoil, rubble, materials, equipment, or unfinished operations be allowed to accumulate in such a manner as to unnecessarily be a hindrance to or impede the activities of other contractors or service providers. In the event of this occurring, the Employer shall have the right to withhold payment for as long as may be necessary in respect of the relevant works in the area(s) concerned.

Upon completion of the Works or any portion thereof, the ground, fences, gates, and any structures that have been interfered with are to be carefully restored to their original condition and all rubbish, tools, tackle, plant, and material must be removed so as to leave the Site in a clean and orderly condition. No additional payment shall be made for work set out above.

It is the Contractors responsibility to take photographs of the site before any construction work commences for record purposes. These photographs are to be provided to the Engineer within 5 days of access to site being granted. Should the site change due to

C3.1.7.9 Special Note Regarding Tie-In / Change Over and Guaranteeing Continuous Flow

Special note should be taken to planning of construction around any tie-in/change over works..

The Contractor, along with his Sub-Contractors, shall note that the Employer is not prescriptive in providing a methodology for the matter, as this is a temporary works responsibility and shall therefore remain the sole responsibility of the Contractors /Sub-contractors as applicable.

Furthermore, no claims by the Contractor (or the Sub-Contractor(s)) shall be entertained by the Employer as items are allowed in the Bill of Quantities and are deemed that the Contractor will price these items to be fully and all-inclusive (material, labour and plant deemed required) to allow the work to be undertaken successfully without any interruption to the water supply.

Hence, a penalty as indicated in terms of the contract data shall be imposed and enforced on the Contractor should the service be interrupted at any given time during the contract period, which can be attributed to the Contractor or their Sub-Contractors.

C3.2 ENGINEERING

C3.2.1 DESIGN SERVICES AND ACTIVITY MATRIX

The responsibility for the design of the permanent and temporary works is set out below per stage below:

Design Service / Activity	Responsibility
Feasibility of overall process	Employer
Concept, feasibility and overall process	Employer
Basic engineering and detail layouts and designs for tender stage	Employer
On site determination of as-built dimensions for construction stage design	Contractor
Permanent Works: Civil and Structural items such as pipelines, splitter boxes, bridges, etc.	Employer with inputs from Contractor in M&E interfaces
Permanent Works: Final mechanical, electrical (LV, control & instrumentation, Telemetry & SCADA) and civil designs to be reviewed for construction stage	Contractor with review by Employer
Temporary works including but not limited to shoring, dealing with sewage, formwork, etc.	Contractor
Preparation of information for As-built drawings	Contractor
Preparation of As-Built drawings and O&M manuals	Contractor

C3.2.2 PERMANENT WORKS REQUIREMENTS

C3.2.2.1 Design Brief

The mechanical / electrical contractor shall be responsible for the related design of his own propriety equipment and systems. All designs shall be done in accordance with good engineering practise, based on the specifications and tender drawings provided in the tender document. The Contractor shall ensure that all equipment designed and/or provided and installed by him shall be of robust construction capable of performing the desired work/duty in an efficient manner.

Although the Engineer may approve drawings and designs of the Contractor, this does not exempt the Contractor from this responsibility. The professional responsibility for such designs shall remain with the Contractor and his Engineer.

The Contractor’s design must take into account the requirements around the switch over of the installation and the temporary works that may interfere with positions of new equipment.

C3.2.2.2 Method Statements for Switchovers

Where existing plant must be taken out of operation for installation of replacement of equipment or a switch-over between old and new equipment, the Contractor shall compile an installation and switch-over method statement for approval by the Employer and Engineer, describing how the work will be completed.

The Contractor shall submit method statements describing how the switch-over at the respective process unit will be done, indicating what influence and risks it has for the Employer.

This method statement shall be submitted to the Engineer for approval (both by the Employer and Engineer) at least four weeks (20 working days) prior to the planned shut-down / installation work. No work shall commence prior to approval by both parties. The Contractor shall allow at least two to three weeks for the discussion and approval process in the construction programme for this.

The Contractor shall make allowance for separate sessions with the Employer and Engineer to discuss and work through each of the method statements regarding switch-over of the installations. Each Session shall be a full day session to possibly discuss multiple units, which can be done electronically through online meeting software. The Contractor shall have representatives present for the mechanical, electrical and civil disciplines, including all travelling time and cost involved to attend the session as applicable.

The installation may only happen 5 working days after approval is provided and notices has been distributed to the operators on the plant.

C3.2.3 CONTRACTOR'S DOCUMENTS TO BE SUBMITTED FOR APPROVAL

C3.2.3.1 General Requirements

The Contractor's Documents shall comply with the following general requirements:

- Three copies of all documents shall be submitted
- A register of all the Contractor's documents shall be provided with each submission
- Drawings shall be prepared in accordance with the latest issue of SANS 10111. An equivalent international code of engineering drawing practice will also be acceptable
- General Arrangement drawings shall be to A1 size
- Drawings shall be to scale, with both scale and the drawing being large enough to clearly show all relevant components of the plant and equipment
- In addition to the usual plant and pipework elevations, sufficient additional sections shall be included to clearly show the arrangement of all plant and equipment
- Plant and equipment shall have unique item reference numbers
- Item lists shall be provided on the drawing or on a separate parts list
- Item descriptions shall include the material of construction, quantity and full identification information, including, as applicable, brand name, manufacturer's reference number, model number, size, rating, source, duty, quantity, etc.

C3.2.3.2 Required Submissions within 42 days

The Contractor shall submit the following for acceptance within 42 days from the Commencement Date:

- Dimensioned layout drawings (preferably A1 size) of the installation showing the proposed layout and design of all plant and equipment. Sufficient sections and elevations must be shown so that the relative arrangement of all equipment is clear. This shall be done for all equipment to be supplied under this Contract
- Process and instrumentation diagram, indicating items of equipment
- Motor load arrangement
- Equipment arrangement drawings of all equipment requirements in respect of the building and civil works
- Loading requirements for the new plinths
- Lifting requirements for new cranes, beams, gantries and any other lifting equipment
- Drawing of pipe support details
- Technical details of all valves for all cooling proposed
- Detailed specifications including sizing, physical and general technical data for all equipment
- Dimensional drawings of motors
- Overall site layout of the Site
- Single line diagram
- Diesel Powered Generator Sets Design and Drawings (see particular specification EL03)
- Fuel system layout
- Cable layout
- FDS contents
- Control philosophy
- Bill of Quantities
- Contractor's Test and Operation and Maintenance Manual
- Quality Control Plan
- Contractor's document register

The date by which the documents of the Site can be handed over to the Contractor and consequently the completion date of the Works, is dependent on the date of submission and acceptance of the documents referred to above, and also depends on Clause 3.5.1 in Part C 3.5 (Management). Cost resulting from delays in submission of the Contractor's Documents or in correcting errors or making changes on documents not approved by the Engineer shall be for the Contractor's account.

C3.2.4 DRAWINGS

C3.2.4.1 Tender Drawings

Reduced drawings form part of the tender document, included as Annexure in Volume 4 and shall be used for tender purposes only. The drawings listed below have been prepared by the Engineer on behalf of the Employer and are attached to give an overview of the project. They are issued to tenderers for pricing purposes and are not construction drawings.

The Engineer's drawings included in this tender document are indicative, conceptual, generic drawings and do not pertain to any particular supplier or manufacturer.

Any ambiguities shall be clarified by the Tenderer with the Engineer prior to the submission of Tenders. Should the Tenderer fail to seek clarification of any differences or contradictions, the Contractor shall be solely liable for any costs that may arise due to his failure in this regard.

The following drawings are applicable to this contract, are issued with this tender document and will form part of the contract documents.

Drawing No.	Drawing required
CIVIL WORKS	
24203-C-000-01	Locality Plan
24203-C-000-02	Existing Services
24203-C-004-01	General Arrangement
24203-C-004-02	Pipework Layout
24203-C-004-101	Typical Detail of Services Route Marker
24203-C-004-103	Detail of Pressure Filter Platform
24203-C-004-104	Typical Detail of Valve
24203-C-007-100	Detail of Transfer Pump Station - Layout
24203-C-007-101	Detail of Transfer Pump Station - Sections
24203-C-007-102	Detail of Transfer Pump Station - Details
ELECTRICAL WORKS	
24203-E-001-01	Electrical Single-Line Diagram
24203-E-002-01	Electrical Site Reticulation
24203-E-003-01	Lighting and Power Diagram
MECHANICAL WORKS	
24203-M-050	Filter Feed Pump Station Isometric View
24203-M-051	Filter Feed Pump Station Foundation Layout
24203-M-052	Filter Feed Pump Station Section A & B
24203-M-060	Pressure Filters Isometric View
24203-M-061	Pressure Filters Elevations
24203-M-062	Pressure Filters Layout
PROCESS DRAWINGS	
24203-P-050	Filter Feed Pump Station P&ID
24203-P-060	Pressure Filter P&ID

C3.2.4.2 Construction Drawings

The Contractor shall be responsible for the compilation of the construction / works drawings for the mechanical and electrical disciplines of the project. Allowance shall be made for all associated costs for the preparation, compilation and amendments of the construction drawings for the duration of the contract.

The Main Contractor shall be responsible to incorporate all design requirements or needs by any of their sub-contractors on the construction drawings and be responsible for all design information required by their sub-contractors.

As described above, construction drawings (detail design drawings) shall be submitted to the Engineer for approval. The approval or acceptance of any drawing by the Engineer shall not remove the Contractor's responsibility and liability for his design, it will remain solely with the Contractor.

Within four 42 days after receiving the Commencement Letter, the Contractor shall supply the following information in duplicate for approval before commencing manufacturing:

- Working or "Shop" drawings of plant/screens/pump installation including main items of equipment to be installed, as well as all cable and wiring diagrams.
- MCC layout and single line diagrams detailing all control metering and indication circuits inclusive of a description of circuit operation
- Generator layout and single line diagrams detailing all control metering and indication circuits inclusive of a description of circuit operation

NOTE:

Drawings must be neat and clearly legible. Circuit diagrams must be done on a grid system with elements of control equipment referred to applicable (grid) line numbers in a schedule directly below the relevant control device.

The Contractor shall supply neat and clearly legible As-Built drawings for all mechanical and electrical installations, including mechanical pipework workshop drawings, electrical circuit single line diagrams, solar array installation, MV or LV bulk line (including coordinates). All drawing shall be included in the O&M Manuals.

C3.2.4.3 Records Drawings (As-builts)

The Contractor shall ensure that accurate as-built records are kept of all infrastructure installed or relocated during the contract. The position of pipe bends, junction boxes, duct ends, and all other underground infrastructure shall be given by either co-ordinates or stake value and offset. Where necessary, levels shall also be given. A marked-up set of drawings shall also be kept and updated by the Contractor. This information shall be incorporated into the Contractor's as-built drawings and submitted to the Engineer for approval.

C3.3 PROCUREMENT

CONTENTS

3.3.1 TARGETED CONSTRUCTION PROCUREMENT
3.3.2 SUB-CONTRACTING
3.3.3 TARGETED CONSTRUCTION PROCUREMENT SPECIFICATIONS

3.3.1. TARGETED CONSTRUCTION PROCUREMENT

3.3.1.1 Objective

The Employer applies and promotes the principles of Targeted Construction Procurement. In terms of Employer's current procurement policy this project provides for the following objectives to be actively pursued:

- the provision of opportunities for Small, Medium and Micro- Business Enterprises (SMMEs).
- the provision of work opportunities for local labour.
- the maximising of job creation by adopting labour-intensive construction methods wherever physically feasible and economically justifiable.

3.3.1.2 Contract requirements

The Targeted Construction Procurement: Participation of Targeted Enterprises and Targeted Labour Standard Specifications is included in Part 3.3.3 of this section C3.3 of the Scope of Works and shall apply as additional Works Specifications to this contract.

For this contract, the Employer has set minimum contract participation goals, calculated as a percentage of the net amount (as defined in clause 3.2.14 below), which are specified in Schedule 24: Preferencing Schedule in Part T2.2: Returnable Schedules.

3.3.1.3 Labour workforce

On this contract, it is the intention that work is provided during the execution of the works for targeted labour residing in the target area (ward 4 and 8 in Bonnievale) as defined and which would normally be the local or nearest communities. Labourers of the local or nearest communities required by the contractor shall be targeted, recruited and employed for work to enable the contractor to comply with the minimum contract participation goals for targeted labour set by the employer for the contract.

3.3.1.4 Labour-intensive construction

Construction work must be undertaken using labour-intensive methods. The Contractor shall employ labourers, artisans and subcontractors for the execution and completion of this work.

Some of the activities, which must be considered as being suitable to be undertaken by labour-intensive methods include the following:

- cleaning and trimming of site
- laying of pipes
- manhole chambers, inlet structures & headwalls
- traffic accommodation

3.3.2. SUBCONTRACTING

3.3.2.1 General

The Contractor shall not subcontract more than 25% of the value of the contract to subcontractors that do not have an equal or higher B-BBEE status level than the Contractor, unless such subcontractors are exempted micro enterprises that can demonstrate to the satisfaction of the Employer's Agent that they have the capability and ability to execute the subcontract works.

Where monetary allowances for provisional sums or prime cost items have been provided in the Bills of Quantities, and where the work is to be executed/supplied by sub-contractors/suppliers then the following selection process shall be followed in respect of the required sub-contractors/suppliers:

Where monetary allowances for provisional sums or prime cost items allowed and the monetary allowance is less than R 300 000, the Contractor shall invite three quotations from suitably qualified sub-contractors/suppliers, the selection of which shall be in consultation with, and to the approval of the Employer's Agent, for the required work or items.
Where these monetary allowances exceed R 300 000 an open tender process will have to be followed in respect of a subcontractor for this work, unless otherwise advised and approved by the Employer. In such cases where a tender process is to be followed, the tender will be issued by the Employer's Agent on behalf of the Contractor.
The quotes shall include full technical descriptions as well as a breakdown of prices, which shall be submitted to the Engineer for approval.

The evaluation of the quotation received must include a preference points system as described in C3.11 of the Tender Data

3.3.2.2 Appointment of targeted enterprise subcontractors

The Contractor is required to appoint domestic subcontractors in order to meet the participation goal for targeted enterprises as indicated in Schedule 24 of T2.2: Returnable Schedules.

The Contractor will be allowed to subcontract any portion of work that he wants to count towards his participation goal and make an award on a domestic subcontract basis, subject to the requirements of Clause 6 of the General Conditions of Contract. The Contractor may procure these subcontractors using his own subcontract selection methodology.

Prior to the appointment of any domestic subcontractor, whose work is to contribute to the participation goal, the Contractor shall submit to the Employer details of the scope of the work subcontracted including the relevant items in the Bill of Quantities, what the subcontract total sum is and what the Contractor's corresponding tender amount is for the same scope of work is including all the relevant Establishment and General sums and any other allowable sums.

In the event that the subcontract total sum is less than 85% of the corresponding Contractor's sum indicated above, or the subcontract total sum is less than 65% of the Employer's internal estimate, the Contractor shall undertake to allow the subcontractor to submit any explanatory information regarding the subcontract to the Employer, and the subcontractor shall agree be interviewed by the Employer or the Employer's Agent to discuss the breakdown of the subcontract sum in order to satisfy the Employer that the subcontractor can complete the work at the amount submitted on a reasonable sustainable commercial basis. If there are concerns about the subcontractor's tender sum the subcontractor shall have the right to withdraw their tender without any sanction of any nature by the Contractor.

If the subcontractor withdraws the Contractor may have to select a different package of work to contribute to his subcontract target or choose and propose to appoint a different subcontractor for the same scope of work, or the Contractor will have to present, for the same subcontractor a re-negotiated subcontract sum that will be acceptable to the Employer. All additional costs that may arise as a result of such a re-negotiation or re-tendering/re-appointment shall be borne by the Contractor.

If a suitable subcontractor cannot be identified for the envisaged scope of works the Contractor shall complete the work at his tendered rates and the associated part of the works shall form part of the works executed by the Contractor and be excluded from counting towards the subcontract participation goal(s).

3.3.3 TARGETED CONSTRUCTION PROCUREMENT SPECIFICATIONS

The following South African National Standard Resource Specifications for the implementation of Targeted Construction Procurement issued and published by Standards South Africa:

South African National Standard SANS 1914-4 : 2002 (Edition 1)
Targeted Construction Procurement : Part 4 : Participation of Targeted Enterprises and Targeted Labour (Local Resources)
shall apply to and form part of this Contract (see Schedule 22 of T2.2 : Returnable Schedules).

Where the South African National Standard SANS 1914-Specification is not bound in this document, it may be obtained from South African Standards (website *www.stansa.co.za)* or inspected, by appointment, at the offices of the Employer's representative during normal working hours.

The South African National Standard Specification makes provision defining targeted enterprises and targeted labour, weightings for different subcategories, for factors and additional requirements to be specified to suit a particular contract. Details of such factors or additional requirements applicable to this contract are contained in this part of the Scope of Work.

Preferences granted in terms of Targeted Enterprises and Targeted Labour (Local Resources) shall be executed in accordance with the conditions specified below and included in **Schedule 24: Preferencing Schedule where preferences are granted in respect of Targeted Enterprises and Targeted Labour (Local Resources) in Part T2.2, Returnable Schedules.**

VARIATIONS TO THE STANDARDISED SANS 1914-4: 2002 SPECIFICATION

Variations, amendments and additions to the SANS 1914-4: 2002 : Part 4 : Participation of Targeted Enterprises and Targeted Labour (Local Resources) Standardised Specification are as set out below. Should any requirements of the variations conflict with other requirements of the SANS 1914-4: 2002 Specification, the requirements of the variation shall prevail.

The number of each clause and each payment item in this part of the project specifications consists of the prefix TP4 (Targeted Procurement – Part 4) followed by a number corresponding to the number of the relevant clause or item in the SANS Specification. The number of a new clause or item which does not form part of a clause or item in the standard SANS Specification and which is included here, is also prefixed by TP4 followed by a new number. The new numbers follow on the last clause or item number used in the relevant section of the standard specifications.

TP4-2. DEFINITIONS (CLAUSE 2)

TP4-2.10 Target Area (Clause 2.10):

Add the following:

For this Contract the following Target Areas shall apply:

1. The geographical area located within **Ward 4 and 8, Bonnievale, labour should be from Ward 4 and 8 in Bonnievale, Langeberg Municipality** - Target Area 1 is **defined as the Local Area for this Contract.**
2. The geographical area, excluding Target Area 1, located within the boundaries of the Langeberg Municipal District.

TP4-2.11 Targeted Enterprise (Clause 2.11):

Add the following :

Targeted Enterprises for this Contract shall be a sole trader, partnership or legal entity from the Local Area.

TP4-2.12 Targeted Labour (Clause 2.12):

Add the following :
The following individuals are defined as the target group for this Contract:

All unskilled labour (100%) to be from Target Area. South African citizens, temporarily employed by the contractor and his subcontractors in the performance of the contract, who permanently reside within the boundaries of Target Area (ward 4 and 8, Bonnievale) as specified. It is incumbent on individuals to demonstrate their claims to such residency on the basis of identification and association with and recognition by members of the community residing within the aforementioned area. It is incumbent on individuals to provide evidence of qualifying for the target groups.

TP4-2.15 Weightings (Clause 2.15):

Add the following :

In terms of Targeted Labour Goal Credit calculations (Section 3.3 of SANS 1914-4) the Weighting Factor for all contributions shall be taken as 1,0.

Add the following new subclause :

TP4-2.16 (new subclause 2.16):

Wages:
The actual amount paid periodically to targeted labour employed by the main contractor and his subcontractors after all deductions made in terms of the law (e.g. UIF) and exclusive of all company overheads and other benefits such as protective clothing, transport etc.

TP4-3. REQUIREMENTS (CLAUSE 3)

TP4-3.1 Contract Participation Goal (Clause 3.1):

Add the following to Subclause 3.1.1:

For this Contract the minimum Contract Participation Goals set by the Employer are.

Contract Participation Goal	CPG_{2min}	Minimum set by Employer
Targeted Enterprises SANS 1914-4 Annex A Method 2 Clause A.2.2.1	CPG_{2Emin}	10 %
Targeted Labour SANS 1914-4 Annex A Method 2 Clause A.2.2.2	CPG_{2Lmin}	3 %
Total Contract Participation Goal SANS 1914-4 Annex A Clause A.3	$CPG_{2Emin} + CPG_{2Lmin} = CPG_{2min}$	**13 %**

Tenders that do not meet each of the individual abovementioned minimum Contract Participation Goals (CPG_{2min}) set by the Employer will not be considered (not applicable if minimum percentage specified is 0%).

TP4-3.2 Achieving the Contract Participation Goal (Clause 3.2):

3.2.1 General

(a) Method 1

In the first paragraph numbered (1) replace the words "not less than 50% of the wages and allowances" *with the words* "not less than **30%** of the wages and allowances".

Delete subclauses (1) and (2) and add the following to Subclause 3.2.1:

For this Contract the Contractor may achieve the specified contract participation goal by the engagement and use of targeted enterprises and targeted labour as outlined in SANS 1914-4 and measured **by using Method 2 only**. The engagement and use of targeted enterprises and targeted labour as outlined in SANS 1914-4, will not be measured by using Method 1 - **Method 1 will therefore not be applicable.**

TP4-3.3 Contract Participation Goal Credits (Clause 3.3):

Add the following new subclause after subclause 3.3.3

3.3.4 Further to the requirements of 3.3.3, credit will be denied should the Contractor not employ Targeted Labour in accordance with comply with the following relevant statutory legislation:

- Basic Conditions of Employment Act 75 of 1997
- Labour Relations Act 66 of 1995
- Employment Equity Act 55 of 1998 (Chapters 1 and 2)
- Occupational Health and Safety Act 85 of 1993
- Compensation for Occupational Injuries and Diseases Act 130 of 1993
- Skills Development Act of 1998

The statutory Department of Labour Government Notice No. R204 of 2 March 2001 : Basic Conditions of Employment Act (No. 75 of 1997) : Sectoral Determination 2 : Civil Engineering Sector, South Africa as amended shall apply in respect of any employer or employee associated with the contract.

In particular the Contractor shall pay his Labour workers at least the minimum wage prescribed in the statutory legislation.

The prime or main contractor who does not meet each of the individual minimum contract participation goals set by the Employer faces the possibility of being sanctioned. (See clause TP4-6 below)

Credits towards the contract participation goal for targeted enterprises will only be accorded to subcontractors / suppliers / manufacturers / service providers who undertake work directly for / to the main contractor. No credits will be accorded to targeted enterprises who are engaged by subcontractors / suppliers / manufacturers / service providers working under the main contractor.

Similarly, credits towards the contract participation goal for targeted labour will be granted for targeted labour employed by subcontractors only if they undertake work directly for / to the main contractor in the performance of the contract. However, in the case of subcontractors who are also targeted enterprises, the value of their targeted labour will, at the contractor's choice, count either towards the CPG for labour or the CPG for enterprise, but not both.

TP4-6. SANCTIONS (CLAUSE 6)

Add the following:
In the event that the Contractor fails to substantiate that any failure to achieve the Contract Participation Goal (CPG_{2E} and/or CPG_{2L}) relating to the granting of a preference was due to quantitative underruns, the elimination of items, or any other reason beyond the Contractor's control which may be acceptable to the Employer, the Contractor shall pay to the Employer penalties (P) in an amount determined in accordance with the following formula :

$$P = 0{,}15 \times \frac{(D - Do)}{(100)} \times N_A$$

where D = tendered Contract Participation Goal (CPG_2) percentage.
Do = the Contract Participation Goal (CPG_2) which the Employer's Representative, based on the credits passed, certifies as being achieved upon completion of the Contract.
N_A = Net Amount
P = Rand value of penalty payable

In applying the above formula the employer may give consideration to the following rules:
a) In the event of the CPG for a sub category item not being achieved, credit may be given to reduce the penalty to the extent that other sub category items under the same main category have exceeded their CPG targets provided that at least 50% of the CPG target for the offending sub category item has been achieved.
b) Where, after applying rule a), one or more of the sub category items still warrant a penalty and the CPG target for the relevant main category has also not been achieved, then only the penalty applicable to the main category item will apply.
c) No credit will be given for exceeding the CPG target of any of the three main categories (Subcontractors, Suppliers/Manufacturers and Targeted Labour)

C3.4 CONSTRUCTION

C3.2.5 TRADE NAMES OR PROPRIETARY PRODUCTS

These Bid specifications aim to not make any reference to any particular trademark, name, patent, design, type, specific origin or producer, unless there is no other sufficiently precise or intelligible way of describing the characteristics of the work, in which case such reference aims to be accompanied by the words “or equivalent”.

TENDERERS MUST THEREFORE NOTE THAT WHEREVER THIS DOCUMENT REFERS TO ANY PARTICULAR TRADEMARK, NAME, PATENT, DESIGN, TYPE, SPECIFIC ORIGIN OR PRODUCER, SUCH REFERENCE SHALL BE DEEMED TO BE ACCOMPANIED BY THE WORDS ‘OR EQUIVALENT”

C3.2.6 Certification by Recognized Bodies

Not applicable to this contract.

C3.2.7 Agreement Certificates

Not applicable to this contract.

C3.2.8 APPLICABLE SPECIFICATIONS

C3.2.8.1 STANDARD SPECIFICATIONS

All work carried out, as well as equipment supplied, must fully meet and be in compliance with the requirements of the Occupational Health and Safety Act (Act 85 of 1993) and the Construction Regulations (2014) issued in terms of Section 43 of the Act.

In addition, the latest revisions of the following statutory regulations, laws and obligations as pertaining specifically to any and all electrical work applicable to this specific project are applicable:

- The regulations of the local Supply Authority
- The regulations of the Client, being either Governmental, Municipal, Parastatal or Private
- Local fire regulations
- SANS 10400-A: 2010 – The application of the national building regulations, Part A:

  General principles and requirements

All references to “SABS” specifications shall be read as “SANS” in light of the recent changes by the South African Bureau of Standards. Where a SANS Standard does not exist or if not applicable, the relevant IEC or BS Standard shall be applicable.

For the Mechanical and Electrical portion of the Scope of Works, in the event of discrepancy between any of the specifications, regulations and codes of practice, the SANS 10142-1 Code of Practice for Wiring of Premises shall take precedence.

Additionally, the following specifications, whether specifically mentioned, or not, within this document, shall also apply:

SANS 1091: 2012	National colour standards
SANS 10140 :2008	Identification colour marking
SANS 156:2007	Moulded case circuit breakers
SANS 60269-1:2010	Low-voltage fuses, Part 1: General
SANS 60269-4:2012	Low-voltage fuses, Part 4: Supplementary requirements for fuse-link for the protection of semiconductor devices
SANS 1507-1:2007	Electrical cables with extruded solid dielectric insulation for fixed installations (300/500V to 1900/3300V), Part 1: General
SANS 60439-1:2004	Low voltage switchgear and control gear assemblies, Part 1: Type-tested and partially type-tested assemblies
SANS 60439-2:2006	Low voltage switchgear and control gear assemblies, Part 2: Particular requirements for busbar trunking systems (busways)
SANS 1973-1:2007	Low voltage switchgear and control gear assemblies, Part 1: Type-tested assemblies with stated deviation and a short-circuit withstand strength above 10kA
SANS 1973-3:2008	Low voltage switchgear and control gear assemblies, Part 1: Safety of assemblies with a rated protective short-circuits up to and including 10kA
SANS 60947:2012	Low voltage switchgear and control gear assemblies
SANS 475:2013	Luminaires for interior lighting, streetlighting and floodlighting – Performance requirements
SANS 10114-1:2005	Interior lighting, Part 1: Artificial lighting of interiors
SANS 10222-5-1-3:2007	Electrical security installations, Part 5-1-3: CCTV installations - CCTV surveillance systems for use in security applications - Installation, planning and implementation requirements
SANS 60793-1-1:2008	Optical fibres, Part 1-1: Measurement methods and test procedures - General and guidance
SANS 10131:2004	Above-ground storage tanks for petroleum products
SANS 780:2009	Transformer Testing
SANS 1084-1/2 : 2014	Electric Motor Standards
SANS 10131:2004	Fuel Tank Design and Construction
SANS 10198:2014	Cable Trenching
SANS 1804:2007	Induction Motors
SANS 62: 2013	Steel pipes
SANS 719: 2011	Electric welded low carbon steel pipes for aqueous fluids (large bore)
SANS 10044: 2004	Welding
SANS 2001 (collection)	Construction works
ISO 12944: 2017	Paints and Varnishes: Corrosion protection of steel structures by protective paint systems

ISO 8501:2007	Preparation of steel substrates before application of paints and related products -- Visual assessment of surface cleanliness
SANS 121:2011	Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods
SANS 32: 1997	Internal and/or external protective coatings for steel tubes - Specification for hot dip galvanized coatings applied in automatic plants
SANS 1123: 2015	Pipe flanges
ISO 4014: 2011	Hexagon head bolts – Product grades A and B
ISO 4032: 2012	Hexagon regular nuts (style 1) – Product grade A and B
ISO 7089: 2012	Plain washers – normal series – Product grade A
SANS 1200 (collection)	Standardized specification for civil engineering construction
SANS 664: 2011	Wedge gate and resilient seal valves for waterworks
BS EN 593: 2017	Industrial Valves. Metallic butterfly valves for general purposes
SANS 1551:2008	Check valves (flanged and wafer types)
ISO 9906: 2012	Rotodynamic pumps -- Hydraulic performance acceptance tests - Grades 1, 2 and 3
ISO 9905: 1994	Technical specifications for centrifugal pumps -- Class I
ISO 5199: 2002	Technical specifications for centrifugal pumps -- Class II
ISO 9908: 1993	Technical specifications for centrifugal pumps -- Class III
ISO 2585: 1975	End-suction centrifugal pumps (rating 16 bar) — Designation, nominal duty point and dimensions
ISO 3661: 1977	End-suction centrifugal pumps -- Baseplate and installation dimensions
BS EN 12756: 2001	Mechanical seals. Principal dimensions, designation and material code

For the Civil / Construction portion of the Scope of Works, the following relevant standardised specifications, as listed below, shall form the Standard Specifications and apply to this contract (or as additionally indicated):

<u>Note:</u> Reference is made in certain of the specifications to other standardised specifications which may or may not be included in the list below, and therefore the list should be considered indicative and not exhaustive. Hence, where reference is to any specification and such specifications are not included in the list, it shall nevertheless be deemed to be included in the contract documents.

SANS (previously SABS) 1200 A :	General (1986)
SANS (previously SABS) 1200 AB :	Engineer's Office (1986)
SANS (previously SABS) 1200 C :	Site Clearance (Amdt 1, 1982)
SANS (previously SABS) 1200 D :	Earthworks (Amdt 1, 1990)
SANS (previously SABS) 1200 DB :	Earthworks (Pipe Trenches) (1989)
SANS (previously SABS) 1200 G :	Concrete (Structural) (1982)
SANS (previously SABS) 1200 L :	Medium-Pressure Pipelines (1983)
SANS (previously SABS) 1200 LB :	Bedding (Pipes) (1983)
SANS (previously SABS) 1200 ME :	Sub-base (1981)
SANS (previously SABS) 1200 MJ :	Segmented Paving (1984)
SANS (previously SABS) 1200 MK :	Kerbing and Channelling (1983)
Particular Specification Part B :	Building Work

These above specifications have not been bound into the document but are available for inspection at the offices of the Engineers or Employer during normal working hours for tender purposes.

For Construction the Contractor shall obtained copies of the specification, which can be acquired as follows:

- The SANS (SANS) 1200 Standard Specifications for Civil Engineering Construction, purchase from the South African Institution of Civil Engineering (SAICE), Private Bag X200, Halfway House 1685, Tel: (011) 805 5947, Fax: (011) 805 5971, e-mail: civilinfo@saice.org.za.

Subsequently, the Contractor shall always have available for reference on site a full set of the above specifications in hardcopy which the Contractor have obtained, together with any other to which they refer in hardcopy. These specifications shall remain the property of the Contractor but shall be made available to the Engineer whenever required throughout the duration of the contract.

Furthermore, the following shall be noted and applied to the standardised specifications:

- The term “project specifications” appearing in any of the SANS 1200 standardised specifications must be replaced with the terms “Scope of Work”.
- Any reference to “Engineer” appearing in any of the SANS 1200 standardised specifications shall be deemed to also refer to “Employer’s Agent” and visa versa.

C3.4.1.1 Variations And Additions to The Standard Specifications

The Mechanical and Electrical Project Specifications shall reference to inhouse Standard Specification, with the intention of the Project Specifications providing the project specification requirements as addition to the Standard Specifications provided. The two types of specifications shall be read in conjunction with one another.

Any additions and variations applicable to the Civil Portion of the Scope of Works shall also be listed in the Tender documentation.

C3.4.1.2 Particular Specifications

The following particular specifications, as listed below shall apply to this contract:

C3.6	:	Mechanical
C3.7	:	Electrical, Control and Instrumentation
C3.8	:	Temporary Works
C3.9	:	Civil Particular Specifications
C3.10	:	Annexures

Please note any reference made to Particular Specifications in the specifications shall be deemed to also refer to Project Specifications and visa versa.

It should be noted, the following shall be adhered to:

- In the event of any discrepancy between the particular specifications and the standard specifications, the schedule of quantities or the drawings, and the particular specification, shall take precedence.
- The standard specifications, which form part of this contract, may cover items not applicable to this particular contract and should be clarified with the Engineer if discrepancies are obvious.

C3.2.9 SITE FACILITIES AND CONTRACTOR'S CAMP SITE REQUIRED

C3.2.9.1 Water Supply

The Contractor shall make and ensure the provision of water for the campsite and office facilities remains the Contractors sole responsibility at all times.

If the Contractor is to use the Municipal mains, the Contractor shall make his own arrangements with the Municipality for the necessary connections and additional reticulation, the cost, if any, of which will be for the Contractors account. Water used by the Contractor from the Employer's mains will be charged for at the tariffs ruling of the time of use.

The Contractor shall also take note that no direct payment will be made for any costs incurred for the provision of any additional water supply points nor for the cost of water used from it. Payment for the aforementioned shall be deemed to be covered by the rates and prices tendered and paid for the various items of work included under the Contract.

The Contractor shall make himself thoroughly acquainted with the regulations relating to the use of water and shall take adequate measures to prevent the wastage of water. The Employer accepts no responsibility for the shortage of water due to any cause whatsoever, nor additional costs incurred by the Contractor as a result of such shortage.

Water shall be used sparingly and if in the opinion of the Engineer excessive consumption by the contractor occurs then the cost of such excessive consumption shall be borne by the Contractor.

C3.2.9.2 Electricity Supply

The Contractor shall make and ensure the provision of electricity for the campsite and office facilities remains the Contractors sole responsibility at all times.

If the Contractor is to use the Municipal mains, the Contractor shall make his own arrangements for the supply of electricity that he may require for the execution of the works and the costs of any connections, additional reticulation and the supply of electricity shall be borne by the Contractor. Electricity used by the Contractor shall be charged for at the tariffs ruling at the time of use.

The Contractor shall take note that no direct payment will be made for any costs incurred for the provision of any additional electrical supply points nor for the cost of electricity used. Payment for the aforementioned shall be deemed to be covered by the rates and prices tendered and paid for the various items of work included under the Contract.

The Employer accepts no responsibility for any power failure due to load shedding or any other cause whatsoever, nor additional costs incurred by the Contractor as a result of such failures.

C3.2.9.3 Other Services

The Contractor shall make his own provision for all other required services for the campsite and office facilities, as well as ensuring the provisions remains the Contractors sole responsibility at all times.

However, it remains the Contractor’s (or any other Sub-Contractor’s) sole responsibility to communicate any specific requirements to the Contractor to ensure adequate provisions are made at tender and during construction at all times.

The Contractor shall ensure that any costs incurred for the provision of other services are covered by the rates and prices tendered and paid for the various items of work included under the Contract. No additional claims shall be entertained by the Employer in this regard.

C3.2.9.4 Facilities for the Contractor

The Contractor shall provide, maintain and remove his own facilities to the satisfaction of the Engineer. The Contractor shall provide the area around his office, stores and sheds (i.e. the “Camp”) with adequate security measures and security personnel to ensure that unauthorised persons do not enter the camp area.

The tendered sums, whether grouped or individually, shall include all costs for the installation, maintenance and removal of any fencing, in addition to all other facilities specified and as required by the Contractor for his own purposes.

The contractor must note that site meetings will be held in the Contractor's site office.
The Contractor shall supply latrine facilities, in the form of chemical toilets for use by his workers or anyone visiting the site. The number of toilets shall be based on one toilet per fifteen (15) personnel on site or as required by local regulations. The Contractor's staff will always use the chemical toilet facilities.

The Contractor shall be responsible for providing and maintaining his own security arrangements for the duration of the Contract.

The site camp and all facilities required must be fully established or to the satisfaction of the Engineer. The Contractor will not be granted access to the remainder of the site until such time.

On completion of the Works, or when ordered by the Engineer, the Contractor shall remove all temporary buildings and latrines and restore the Site to a clean and sanitary condition to the satisfaction of the Engineer and rehabilitate the area in accordance with the EMP.

Access to the site and site camp will be in a controlled manner. People visiting the site will have to sign in and out on a daily basis.

The Contractor shall also provide a desk for the CLO in one of his/her offices.

On completion of the construction works the surface of the area utilised shall be re-instated.

C3.2.9.4.1 Location of Contractors Camp Site

The Contractor will be permitted to use the area near the site (within the boundary of the WTW) for the establishment of a camp site and office accommodation for his construction personnel. The choice of all sites for the establishment of camps is subject to the written approval of the Employer and the Engineer.

The Contractor shall be responsible for obtaining the necessary permission/s from the relevant authorities and communities for the establishment of the offices, camp and depot as applicable and as no housing is available for the contractor's employees, all arrangements for the housing and transporting to and from the site his Contract workforce. No part of any public space, government reserve or national or provincial Road reserve may be used for either the Contractor's camp or for housing the Contractor's workforce. The Contractor must note that no extension of time due to any delays resulting from transporting his Contract workforce will be granted.

The Contractor may not commence with the establishment of the site camp until such time that the Construction Work Permit is issued (if applicable).

The Contractor shall ensure the latrine facilities for his workers shall be located in close proximity to the individual work areas. The Contractor shall be responsible for providing and maintaining his own security arrangements for the duration of the Contract.

On completion of the Works, or when ordered by the Engineer, the Contractor shall remove all temporary works, buildings and latrines and restore the Site to a clean and sanitary condition to the satisfaction of the Engineer and rehabilitate the area in accordance with the local environmental regulations for the set area.

Access to the site will be in a controlled manner. People visiting the site will have to sign in and out on a daily basis and all Health and safety, as well as COVID screening measures shall be exercised. (as applicable).

C3.2.9.4.2 Housing

No housing is available nor shall be allowed on site for the Contractor's employees. It is the sole responsibility of the Contractor at his own cost to house his employees and transport them to and from the site.

C3.2.9.5 Facilities for the Engineer (and/or the Engineer's Representative)

A separate office for the Engineer or his representative is required and the contractor must provide airconditioned (24 000 BTU) floor space of 24m2 containing a table with top size of 3m2, a lockable drawer, a chair, 1m long by 1.4m high shelve cupboard and a plan cupboard in one of his offices on-site for the exclusive use by the Engineer or his representative for the duration of the contract. The Engineer or his representative shall also be allowed the free use of the Contractor's facilities.

The Engineer's Representative shall also be allowed the free use of the necessary survey equipment and survey assistants to enable him to carry out control work as and when required. In addition, the Contractor is to provide a meeting airconditioned (24 000 BTU) facility that can accommodate a minimum amount of 10 people.

A separate ablution facility for the sole use of the Engineer, his representative or for meetings with the Client will be provided. The Contractor will be responsible to service this ablution facility but the keys will be provided to the Engineer

Requirements:

- Airconditioned Workspace (Table, Chair, Drawer, Shelve, Cupboard) for Engineer or his representative.
- Meeting facility able to accommodate 10 people (Chairs, table, internet connection and air conditioning).
- Separate ablution facilities for the Engineer and Meeting Room.

All such facilities shall be provided promptly on the commencement of the Contract and failure on the part of the Contractor to provide any facility required in terms of the above, the specifications or any part of the contract, shall constitute grounds for the Engineer to withhold payment of the Contractor's tendered Preliminary and General items until the facility has been provided or restored as the case may be.

C3.2.9.5.1 Electricity supply for the Engineer's office regulation

All electricity supply to the Engineer's office(s) and meeting space (if applicable), whether provided by the Contractor by way of a reticulated supply from a local authority or other authorised electricity supply, or by way of on-site generators, shall be regulated by the Contractor to within limits such as to prevent damage due to fluctuations in the electrical current supply that may occur to any electrical plant and equipment provided by the Contractor or the Engineer.

The Contractor shall be liable for and pay to the Engineer on demand, all costs that the Engineer may incur in the repair or replacement of any electrical equipment provided by the Engineer on the Site. Reliance by the Contractor on the regulation of the electrical supply by the supplier or on current regulators fitted to generators shall not absolve the Contractor of his liabilities in terms of this Subclause and, where appropriate, the Contractor shall provide and install at his own cost, all such electrical current-regulating equipment as is necessary to prevent damage to the said equipment.

C3.2.9.5.2 Site instructions book and Site diary book

An A4 triplicate book is to be used for daily diaries and must be provided by the contractor which shall at all times be kept on the site.
Furthermore, the contractor will also provide a Site Diary for daily completion by the Contractor which shall also be kept at all times on the site.
Site instructions will be issued electronically by the Engineer.

C3.2.9.6 Contract and Notice Boards, Signs and Barricades

C3.2.9.6.1 Contract Boards

The Employer or the Engineer will provide the Contractor with a template for the manufacture of the contract nameboard/s. Payment for such nameboard/s will be claimed by the Contractor under the relevant payment item. The Contractor shall provide, erect and maintain two(2) contract name boards. The nameboard/s will have to be erected at the commencement of the works on site and will need to be maintained in good condition for the duration of the contract period. The exact position for the installation of the nameboard/s will be pointed out to the Contractor by the Employer.

The nameboard/s will be removed and disposed of by the Contractor at the conclusion of the defect's liability period. The cost for such removal and disposal needs to be included in the tendered rate allowed for the nameboard/s in the contract bill of quantities.

Should the Contractor wish to erect any signage or display any advertisements within the site other than the approved contract nameboard, it may only be done with the prior written approval of the Employer.

C3.2.9.6.2 Notice boards, signs and barricades

All notices, signs and barricades may be used only if approved by the Engineer. The Contractor shall be responsible for their supply, erection, maintenance and ultimate removal and shall make provision for this in his tendered rates. The Engineer shall have the right to instruct the Contractor to move any sign or notice to another position, or to remove it from the Site of the Works if in his opinion it is unsatisfactory, inconvenient or dangerous.

C3.2.9.7 Laboratory Facilities

The Contractor shall provide and allow for his own facilities, apparatus and procedures for the testing of materials and the process control testing of materials and workmanship in order to ensure compliance with the requirements of the Specifications. The Engineer shall only carry out acceptance testing, as and when required control tests.

C3.2.9.8 Other facilities and services

C3.2.9.8.1 Waste Disposal

The Contractor shall make his own arrangements for solid and liquid waste disposal. Disposal will take place at an approved Site and disposal slips shall be filed in the site environmental file.

Adequate recycling containers for collection of refuse in separate containers (plastic, glass, paper etc.) shall be provided by the Contractor. All containers shall have lids.

C3.2.9.8.2 Telephone Facilities

The Contractor shall be responsible for arranging his own telephone facilities and shall be responsible for all costs relating thereto.

C3.2.9.8.3 Ablution Facilities

Ablution facilities are not available on site. The Contractor shall therefore make the necessary arrangement to provide these facilities. Chemical serviced toilets shall be the minimum acceptable standard as indicated in the EMP.
These must be placed in a position to be approved by the Engineer. The facilities must be to the Engineer's approval and must be maintained in a clean and sanitary condition.

C3.2.9.8.4 Other Services and Facilities

The Contractor shall make all medical and safety equipment as required available.
In addition, the Contractor shall provide adequate facilities for training of personnel (limited duration and permanent employees) for the duration of the construction project.

C3.2.9.9 Security

The provision of security for the Contractor's Site Establishment shall be his own responsibility and no claims for additional security measures taken during the currency of the contract will be considered.
The minimum specification for the required security fence surrounding the site camp follows:

- The fence is to consist of 2,1m high welded mesh, supported on precast concrete "Y" posts set in concrete at 3,0m centres with coiled razor wire security fixed above the fencing. A 4,0m wide lockable double access controlled gate with coiled razor wire overhang is to be included.

The Contractor must take note of the general crime problems which take place in the area and provide a balanced system which will provide the maximum of security for his personnel and reduce the risk of criminal theft. The Contractor's security system must be approved by the Engineer before construction commences.

The minimum-security requirement is for the Contractor to employ one-armed Security Guards from an approved Security Company to provide 24 hours armed security and response, 7 days a week for the duration of the project.

Adequate shelter and toilet facilities shall be provided to the security personnel.

C3.2.9.10 Protection of the Works against Flooding

Temporary works are required by the contractor to deal with the flow of water through the works. The area where construction is taking place may have a high-water table and if an item to deal with water is not separately schedules, the rates tendered for all construction work shall be deemed to cover the installation of such a system, the maintenance thereof, and the necessary reinstatement on completion of the works.

The Contractor shall also provide sumps, pumps, furrows, berms and/or coffer dams to divert water flow away from the construction activities; and other temporary works as may be necessary to minimise damage, inconvenience, or interference, for 24 hours a day, 7 days a week throughout the period of Construction, to adequately protect the works from flooding and damage by storm and ground water.

The Contractor is to ensure that they make provision in their tendered sums/rates to allow for dealing with ground water (high water table) and surface water as detailed above. Refer to annexure C5 for the Geotechnical Report completed.

C3.2.9.11 Water for Testing, Cleaning and Disinfection

Water for cleaning and testing of the works is to be provided by the Contractor.
Sufficient water is to be made available by the Contractor for the testing of all the elements that require cleaning and testing of the works.

Arrangements for a water source shall be made by the Contractor and will be for the Contractors account. The Contractor must ensure that the tendered rates make provision for those activities requiring water.

C3.2.10 PLANT AND MATERIALS

C3.2.10.1 Plant, Construction Equipment and Materials Supplied by the Employer

No "free issue" plant, construction equipment and materials will be incorporated in this contract.

C3.2.10.2 Materials, Samples and Shop Drawings

It is a requirement of this contract that all commercial/imported materials to be built into the Works be inspected and approved by representatives of the Employer and the Engineer to ensure adherence to the specifications.

Samples of all materials will be required to be presented to the Engineer Representative on site for approval. Materials built into the permanent works without prior approval of the Engineer Representative may be ordered to be removed and replaced with approved materials. Such inspections and approvals may include but are not limited to the following:

- Road and layer works materials
- Imported earthworks materials
- All pipe materials and related pipe fittings and pipe specials
- Manhole rings and covers
- Etc.

The Contractor shall note that any approvals shall in no way alleviate or exempt the Contractor of his responsibilities to comply to the required specifications in any way.

C3.2.11 TESTING AND QUALITY CONTROL

C3.2.11.1 Contractor to Engage Services of an Independent Laboratory

Notwithstanding the requirements of the prescribed applicable civil specifications pertaining to testing and quality control, the Contractor shall engage the services of an approved independent laboratory to undertake all testing of materials, the results of which tests are specified in, or reasonably to be inferred from the Contract, as to be taken into consideration by the Engineer in deciding on whether the quality of materials utilised and workmanship achieved by the Contractor complies with the requirements of the specifications. The foregoing shall apply irrespective of whether the said testing is indicated in the specifications as to be carried out by the Engineer or by the Contractor.

The Contractor shall be responsible for arranging with the independent testing laboratory for the timeous carrying out of all such testing specified in the Contract, at not less than the frequencies and in the manner specified and arranging the test results in an orderly manner and indicating on a drawing the various test positions. The Contractor shall promptly provide the Engineer with copies of the results of all such testing carried out by the independent laboratory.

For the purposes of this clause, an "independent laboratory" shall mean an "approved laboratory" (as defined in Sub-clause 7.2 of the applicable specifications PSA) which is not under the management or control of the Contractor and in which the Contractor has no financial interest, nor which has any control or financial interest in the Contractor.

C3.2.11.2 Additional testing required by the Engineer

In addition to the provisions of "C3.2.11.1" above, the Engineer shall be entitled at times during the Contract, to require that the Contractor arrange with the independent laboratory, to carry out any such tests, additional to those described in Sub-clause "C3.2.11.1" above, at such times and at such locations in the Works as the Engineer shall prescribe. The Contractor shall promptly and without delay, arrange with the independent laboratory for the carrying out of all such additional testing as required by the Engineer and copies of the test results shall be promptly provided to the Engineer in an acceptable format with the test positions which shall be indicated by the Contractor on a drawing.

C3.2.11.3 Cost of Testing and record keeping

The Contractor shall record all test results in tabular form in Excel which shall include a unique reference number, description of test, requirements/specified minimum, actual test result, date of test, position of test and Fail/Pass. Should a test indicate a failure the table shall include a reference to a further test of the rework indicating an acceptable test result (Pass).

The Contractor shall in addition on a continuous basis update a separate set of as built drawing(s) with all the test results. An updated table and drawing must be submitted the Engineer on a monthly basis for approval. All actual test results shall also be submitted to the Engineer (apart from the copy forwarded on receipt from the laboratory) with the unique reference number marked on the top right corner.

(a) Tests in Terms "C3.2.11.1" above

The costs of all testing carried out by the independent laboratory in accordance with the requirements of "C3.2.11.1" above shall be born by the Contractor and shall be deemed to be included in the tendered rates and prices for the respective items of work as listed in the Schedule of Quantities and which require testing in terms of the specifications. No separate payments will be made by the Employer to the Contractor in respect of any testing carried out in terms of "C3.2.11.1" above.

Where, as a result of the consistency of the materials varying or as a result of failure to meet the required specifications for the work, it becomes necessary to carry out additional tests (e.g. re-tests on rectified work and/or replacement materials), the costs of such additional testing shall be for the Contractor's account.

Should the Contractor fail to timeously arrange or undertake the required test or fail to timeously present the test results and drawing with test positions, the Engineer may proceed with arranging the testing and all costs related to the arrangement of the tests, the cost of testing and any other associated costs will be deducted from payments due to the Contractor.

(b) Additional Tests required by the Engineer

The costs of any additional tests required by the Engineer in terms of "C3.2.11.1" above shall be reimbursed to the Contractor against substitution of the Provisional Sum allowed therefore in the Bill of Quantities; provided always that the costs of any such additional tests ordered by the Engineer, the results of which indicate that the quality of the materials utilised and/or the standard of workmanship achieved is not in accordance with the specifications, shall not be reimbursable to the Contractor.

C3.2.12 CONSTRUCTION EQUIPMENT

C3.2.12.1 Special Requirements for Equipment

There are no special requirements for any of the construction equipment other than the minimum stated elsewhere in the contract.

C3.2.12.2 Equipment Provided by the Employer

No construction equipment will be provided by the Employer.

C3.2.13 SITE USAGE

The contractor will be allowed to work within the site boundaries and areas indicated on the drawings. The areas where additional special precautions must be taken and/or working permission to be obtained, will be pointed out on site by the Engineer or the Client Representative / Project manager. Any work done outside the allowable area prior written permission can lead to penalties.

C3.2.14 WAYLEAVES, PERMISSIONS AND PERMITS

The Contractor shall be responsible for obtaining all of the necessary wayleaves, permissions or permits applicable to working near any existing services or other infrastructure on Site, and shall ensure that any wayleaves, permissions or permits obtained by the Engineer prior to the award of the contract are transferred into the Contractor's name.

The Contractor shall abide by any conditions imposed by such wayleaves, permissions or permits.

The Contractor shall ensure that all wayleaves, permissions and permits are kept on site and are available for inspection by the relevant service authorities on demand.

The Contractor shall also ensure that any wayleaves, especially in respect of electricity services, are renewed timeously every three months.

C3.2.15 ALTERATIONS, ADDITIONS, EXTENSIONS AND MODIFICATIONS TO EXISTING WORKS

The Contractor must confirm in writing to the Engineer within fourteen(14) days after the site has been handed over to him, that he has satisfied himself that the dimensional accuracy, alignment, levels and setting out of existing structures or components thereof are compatible with the proposed works and if required shall notify the Engineer of any areas of dissatisfaction immediately so that the necessary changes can be made to the layouts and design levels.

C3.2.16 INSPECTION OF ADJOINING PROPERTIES

The contractor will be required to inspect, with the owners, the various properties bordering on the construction site and record any pre-existing damage or defects to buildings, structures, roads or pipes. Accurate records need to be kept by the Contractor in the event that claims are received from neighbouring property owners for damages to their property.

C3.2.17 WATER FOR CONSTRUCTION PURPOSES

The Contractor should note there will be very little metered potable water supply available at the site and shall make his own provisions for water, unless otherwise confirmed by the Employer at tender stage for construction purposes. The Contractor shall furthermore ensure the cost for water is covered and fully inclusive in the rates provided for items requiring water.

The Contractor should note, in the event if the Municipality agrees at the Contractors request to allow usage of final treated effluent form the nearest Municipal Waste Water Treatment Works (WTW) that any costs related to the application for and collection of final treated effluent including fuel, transport, charges at WTW, etc. will be deemed to be fully included in the contract rates. If there are any other sources of water available on site which have not been identified at the time of tender in the form of rivers, streams, fountains or groundwater, which the Contractors request for usage as a source of water needs to be approved by the Employer for access and Engineer for adequacy before making use of such source. The Contractor should allow for suitable water quality testing of the approved source if not of known potable quality prior to use in the works, unless regular testing of the source water is being done by the Distributor, Provider or the Employer at the source of collection. Such water quality results are to be provided to the Engineer for approval prior to such water being used in construction of the works.

Water required for mixing of concrete must be of potable standard and the Engineer will not allow the use of any other sources for these purposes. The Contractor will be required to arrange water trucks for water delivery to site for concrete items of work.

The Contractor shall note that any approvals shall in no way alleviate or exempt the Contractor of his responsibilities to provide suitable and reliable water for construction purposes.

C3.2.18 SURVEY CONTROL AND SETTING OUT OF THE WORKS

Survey pegs will be indicated to the Contractor. The Contractor shall be solely responsible for the protection of the survey pegs.

The Contractor will be expected to use these benchmarks as the basis for all survey control and the setting out of the works.

The Contractor will assume full responsibility for the accuracy of their setting out of the works. The Engineer will do regular inspections on site to confirm the accuracy of the setting out of the works. The Contractor will be expected to make the necessary staff and equipment available to the Engineer for such inspections. Any portions of the work found to be outside of the relevant tolerances as specified will have to be redone at the Contractor's cost.

C3.2.19 EMPLOYMENT OF SECURITY PERSONNEL

All security staff employed by the contractor for the contractor or on behalf of the Employer or at any Municipal property must be registered with Private Security Industry Regulatory Authority (PSiRA). Proof of such registration must be made available to the Engineer upon request.

C3.2.20 UNIVERSAL ACCESS

In pursuit of becoming a fully accessible city, the Municipality expects all Consultants and Service Providers to design and construct to SANS Standards for accessible Design, and any relevant Municipal documents as may be relevant, and to exhibit a commitment to employing Universal Design Principles in their design, construction, service and product delivery of construction projects. This applies to all projects whether new, temporary, upgrades or rehabilitation works.

The contractor will engage with project representatives and the Municipality's Universal Accessibility Department on how Universal Design Principles will enhance accessibility, within this project, that meets a variety of needs and creates a city that is accessible to everyone.

C3.2.21 EXISTING SERVICES

C3.2.21.1 Known Services

Provisions of "3.1.6.2" in "Part C3: Scope of Work", C3.1: Description of the Works" shall be applicable.

Furthermore, the Employer will make available all information relating to known services within the proposed work boundaries and the immediate vicinity prior to the start of the construction of the works. The Contractor will be expected to expose and detect the location of such known services in all locations where they may interfere with the construction of the Works. Where such known services are located, the Contractor will be expected to mark and keep accurate

records of the location and depth of services. The Contractor must provide the complete set of records to the Engineer and highlight deviations from the Employer's as-built records.
Under no circumstances shall the Contractor alter or in any way interfere with the existing works or underground services unless authorised by the Engineer. The Contractor will be held responsible for damages to any existing works and any damages caused shall be made good at his own cost without delay.

Where existing works are of such a nature that the Engineer may require them to be moved by the Contractor, the cost of such work will be paid for at scheduled rates or on dayworks basis as agreed by the Engineer in writing. Alternatively, the Engineer may rather amend the required design if he determines the impact more suitable.

The Contractor should note that the contractor shall exercise care when the proposed work is to cross an existing service, or work is to be performed close to an existing service, and the contractor shall take whatever precautions necessary to protect these services from damage during the period of the Contract. Prior to commencement of the relevant portion of the proposed works the Contractor with the Engineer or his duly appointed representative shall also perform a visual inspection of the area in question and the exposed services. This inspection will not waive the Contractor of his obligations with respect to care of the works referenced in the General Conditions of Contract.

Other existing services which are not indicated may also exist and affect the works to be constructed under this contract. The Contractor shall therefore ensure before excavating that there are no visible services or obstructions that require safeguarding near the work area.

C3.2.21.2 Treatment of Existing Services

The Contractor will be required as part of this contract to connect all piped services to the existing surrounding infrastructure. Where outages to sections of the water and sewer networks are required, the Contractor is expected to apply to the Employer for such outages in a timeous manner. Connection to any of the existing services will be done strictly according to the requirements of the municipality.

C3.2.21.2.1 Use of Detection Equipment for the Location of Underground Services

Where exposure of existing services by hand excavation is not feasible it is expected that the Contractor will acquire and make use of appropriate detection equipment. Costs for the purchase and/or hire of basic cable route and pipe flow detection equipment shall be included in the contracts rates. No additional payment will be certified should the use of such equipment be required.

C3.2.21.2.2 Damage to Services

The Contractor shall be held liable for damage to all known services and services where the location can be reasonably predicted in the execution of this contract. If an underground service is located within 2m (in all directions) of the position shown on as-built records, it will be deemed to be a known service.

The Contractor shall be responsible for any damage to such known existing services and works in the execution of this contract and shall reimburse the Employer, authority or the owner concerned for any repairs required and for damages. Damage that occurs to unknown services during construction will be paid for by the Employer, providing the contractor has not acted negligently.

C3.2.21.2.3 Reinstatement of Services and Structures Damaged During Construction

The reinstatement of services and structures damaged by the Contractor or his subcontractor during Construction will be the responsibility of the Contractor, unless the service or structure to be reinstated is of a specialised nature. Damaged services must be repaired on the same date of occurrence and not be delayed without the written approval of the relevant service authority or the employer. The Contractor shall render all reasonable assistance to the keep the service or structure while reinstatement of the service or the structure if required.

The reinstatement of services not declared specialised by nature, shall be to the same state as it was before the damage occurred at the cost of the Contractor. Approval from the Engineer is to be sought before commencing with any reinstatement or repair of services and structures.

Reinstatement of specialised services and structures will be done by the Employer for the Contractor's account.

C3.2.22 CONSTRUCTION IN CONFINED AREAS

It will be necessary for the Contractor to work within confined and restricted areas. The method of construction in these confined areas largely depends on the Contractor's construction plant.

Regardless, measurement and payment will be in accordance with the specified cross-sections and dimensions only, irrespective of the method used for achieving these cross-sections and dimensions. It is deemed that the rates tendered in the Pricing Schedule / Bill of Quantities include full compensation for all special equipment and construction methods and for all difficulties encountered when working in confined areas and narrow widths, and at or around obstructions. No additional payment will be made nor will any claim for payment be considered for work done in such confined areas, despite indications to the contrary in the Standard Specifications.

The environment needs to be respected during the construction stage. The footprint must be discussed before the start of construction and no construction or movement of vehicles should take place outside these allocated areas.

C3.2.23 DEALING WITH WATER

The Contractor should take cognisance of all the available information provided in this document and consideration ground water may well be encountered in trench, foundation, and general excavations.

The Contractor shall therefore make provision and allow for all dewatering and keeping dry such excavations as if the water table would be at existing ground level. If not specifically scheduled or specified in the scope of work, all costs for this operation for the duration of the contract shall be deemed to be included in the General charges of the Contractor.

C3.2.24 FEATURES REQUIRING SPECIAL ATTENTION

C3.2.24.1 Connection into Existing Services

All connections to the existing sewers / chambers shall be undertaken at times and in a manner to be approved by the Engineer. For connection purposes the existing pipework must remain in operation at all times.

The Contractor shall responsible to design, construct and maintain all temporary works including equipment and any other requirements to allow appropriate conditions for proper safe connections to the existing works.

The Contractor shall immediately remove and dispose of all offensive matter spilled during the bypass pumping at his own expense. The Contractor shall also be responsible for paying any fines imposed as a result of spills or overflows that occur as a result of the connection work.

C3.2.24.2 Protection of the Environment

The Contractor shall ensure that no damage whatsoever is caused as a result of their operations or otherwise by their workmen in the areas adjacent to the site.

The movement of plant and workmen shall be restricted to the construction areas and essential access routes. No Contractor's workmen will be permitted outside these areas.

Within and in the proximity of the site, the Contractor shall take steps to protect all property, features, landscaping, vegetation, and soil not directly affected by the Works and shall ensure that no avoidable damage and disturbance is caused, and that no erosion is allowed to occur.

No fires may be lit. The Contractor shall ensure that the fire hazard on and near the Site is reduced to a minimum and shall take immediate and effective steps to extinguish any fire that may break out. Vegetation and trees cleared from the Site may not be burnt on or in the proximity of the Site.

The Contractor's shall remove rejected and surplus material, debris and rubbish at the earliest opportunity and shall on a day-to-day basis keep the Site neat and tidy to the satisfaction of the Engineer.

The Contractor's attention is also drawn to the requirements of Clause 4.18 and 11.11 of the Contract Conditions or as amended in the Contract Data. Further, the Contractor shall indemnify the Employer against any liability arising out of the Contractor's non-compliance with his obligations to the protection of the environment.

The Contactor shall ensure that their staff are properly instructed and carry out the requirements of this clause. The Contractor will be held liable for all unauthorised damage caused by them or any of their staff.

The cost of all duties and precautions specified above shall be covered by the rates tendered for in the Preliminary and General Section.

C3.2.24.3 Protection of the Existing Services

The Contractor shall ensure that no damage whatsoever is caused as a result of their operations or otherwise by their workmen to the entire length of the existing services. The existing services to be operational at all times.

C3.2.24.4 Notification of Landowners

The Contractor is to ensure that all landowners are to be notified 1 month prior to construction commencing in their properties.

C3.2.24.5 Quality Assurance (QA)

(Read with SANS 1921 – 1: 2004 clause 4.4)

The Contractor will be solely responsible for the production of work that complies with the Specifications to the satisfaction of the Engineer. To this end it will be the full responsibility of the Contractor to institute an appropriate Quality Assurance (QA) system on site. The Engineer will audit the Contractor's quality assurance (QA) system on a regular basis to verify that adequate independent checks and tests are being carried out and to ensure that the Contractor's own control is sufficient to identify any possible quality problems which could cause a delay or failure. The Engineer shall inform the Contractor on the amount, frequency and type of testing and site inspections to be performed by the Engineer.

The Contractor shall ensure that efficient supervisory staff, the required transport, instruments, equipment, and tools are available to control the quality of his/her own workmanship in accordance with his/her QA-system. His/her attention is drawn to the fact that it is not the duty of the Engineer or the Engineer’s assistant to act as foreman or surveyor.

C3.2.24.6 Properties Affected by the Construction Activities

Properties will be affected by the construction activities. The following items to be addressed by the Contractor prior and during construction,

- Barricading of the trench excavation is essential.
- Maintained temporary alternate access to the properties is to be provided by the Contractor, which may include the removal of existing boundary walls and the provision of temporary fencing and gravel access roads.
- The final stage will be tidying up, removing temporary fencing, reinstating existing fencing / boundary walls, closing the temporary access, and opening the existing access.

- The Contractor will be required to ensure that dust is kept to a minimum during construction by regularly watering the sandy surface areas.
- All costs related to the above requirements are to be allowed for by the Contractor in the items scheduled in the tender document. No other claims will be entertained.

C3.2.1 TESTING, COMPLETION, COMMISSIONING AND CORRECTION OF DEFECTS

C3.2.1.1 General

Workmanship, tolerances and frequency of testing are to be in accordance with relevant specifications. It is deemed that the Contractor has made provision in his tender for all such services and tests that are required from him. It is the duty of the Contractor to, at his own cost and by means of the necessary tests, proves to the Engineer that the works and compaction where prescribed, comply with the specification.

The Engineer reserves the right to appoint independent testing laboratories to monitor the results returned by the Contractor for the Quality of materials and work performed. The Contractor shall conduct his own testing as work proceeds to ensure that the necessary requirements and specifications are being complied with. Once the Contractor is satisfied as to the completion of any stage of his work, he shall arrange for the following:

a) Necessary measurements (survey, levels, etc.) are taken for computation of quantities.
b) Information must be submitted to the Engineer for approval.
c) The said stage shall be tested by his own laboratory, the Engineer and/or any other party requested by the Engineer. This testing shall take place jointly by all the parties involved and at the direction of the Engineer.
d) Only once the measurement information and the results from the required tests have been submitted to and approved by the Engineer, will the Engineer issue a site instruction to proceed with the next stage.
e) Both the Contractor and the Engineer will keep the measurement information and all test results for each stage in a filing system that will enable easy access. All samples taken for testing shall be suitably referenced to enable them to be traced. This includes a dimensioned site plan where necessary.
f) The Contractor shall arrange for each testing as described above at least 24 hours in advance. Should the Contractor fail to request an inspection timeously and proceed with work without the Engineer's approval, this will be at his own risk.

C3.2.1.2 Factory and Laboratory Testing

The following equipment must be demonstrated in the factory to the Engineer and all equipment necessary to test the performance and operation of said equipment must be provided:

1. Electrical Distribution Boards
2. Motor Control Centres (MCCs)
3. Power Factor Correction Equipment (PFC)
4. equipment: paddle drive, grit classifier
5. Mechanical equipment – new and refurbished

Before the Engineer is called to witness any testing, the Contractor must test the equipment and integrated control system on his own and confirm in writing to the Engineer that the equipment conforms to specification. Refer to each section of equipment with the project specification for detailed testing requirements.

C3.2.1.3 Site Testing, Commissioning and Trial Operation Perioda

C3.2.1.3.1 General

The complete plant as installed must be functionally tested by the Contractor, and thereafter commissioned and optimised to ensure a fully functioning and compliant installation. Due to the nature of the project and the implementation of the installations, multiple commissioning and testing sessions might be held. The Contractor shall allow for all costs involved for such cases, including having all the relevant sub-contractors on site for this.

Due to the phasing of the installation, connections to existing infrastructure and keeping shutdown periods as short as possible, some installation shall be dry-commissioned before shutdowns are done to ensure the operation of the installation when the installation are made live after a shut-down. The Contractor shall allow for all costs involved for such cases, including having all the relevant sub-contractors on site for this.
No section of the plant may be made 'live' until a valid and complete Certificate of Compliance (COC) has been issued for said section of plant.

C3.2.1.3.2 Functional tests that must be carried out by the Contractor and recorded must include:

- Mechanical installation:
  - Direction of motor rotation
  - Laser alignment of pump sets
  - Leak detection
  - Operational test of each process component (i.e screening process and degritting process)
- Electrical installation:
  - Phase rotations
  - Insulation tests
  - Continuity paths
  - Routine tests as required per manufacturer equipment
  - Energy meter calibration and integration with Client and Supply Authority, where required, including energy meter orientation and functional operation
  - Measuring of voltages and currents, including overload protection settings
  - Phase balancing for as even distribution as possible
  - Site specific levels, pressures, flows
  - All final system setpoints, values, protection settings and other applicable data must be compiled into a singular tabular format and included into the manuals to act as a basis for any further changes in the future.

- Civil Construction:
    - All test as stated in the Volume 2 of 3 Section 3 Scope of Works specification.

C3.2.1.3.3 Plant Commissioning and Optimisation:

It is required that the functional plant be run and further monitored to ensure that it runs at its most efficient point. The Contractor's commissioning responsibility shall include the optimization of the plant where setpoint adjustments, protection settings, energy meter analysis and small system changes must all be implemented as part of the commissioning task. The Contractor shall allow for a minimum of 7 days for the optimization of the plant.

It is envisioned that multiple testing and commissioning sessions will be done by the Contractor due to the nature of the different processes. The Contractor shall therefore need to allow for multiple trips, sessions and inspections, with the relevant personnel present at the respective commissioning's. Adequate provision must be made in the P&Gs BOQ components to cater for this phased implementation approach and no additional claims in this regard will be entertained.

Only once the Contractor confirms in writing that both the functional tests and commissioning optimisation tasks have successfully been conducted and that their performance and results are in line with the specification requirements, including providing the relevant data as requested above, can a date be set for the site technical inspection and Functional Testing by the Engineer before the start of the Trial Operating Period.

C3.2.1.3.4 Functional Testing of Installation Prior to the Start of the Trial Operation Period

Once the Contractor has confirmed in writing that the functional plant testing, commissioning and optimisation has been done and the plant is operating under stable conditions, including the first round of Employer and operator training, as well as a draft manual is in place, can a date be set for the technical inspection prior to the start of the Trial Operation Period.

The Contractor will be required to make suitable arrangements for demonstrating the plant and equipment supplied under this contract in the presence of the Employer and the Engineer or their representatives, to prove it fully complies with the specification. Any or all of the test results must be demonstrated to the Engineer at his request.

The Contractor shall allow for all costs involved to have a competent person per applicable discipline, including all specialist sub-contractors (and suppliers where required), fully conversant with all aspects of operation, present to carry out the demonstration. Preferably the representatives responsible for the final commissioning and optimization must be present at the testing session.

The TOP shall only start once the entire plant passes all tests and inspections by the Engineer and Employer, and achieve the requirements set out in the Scope of Works.

Should the plant not pass the Functional Testing, the Trial Operating Period shall not commence. All snags listed by the Engineer shall be corrected before second Function Testing shall be arrange where the plant shall be re-test by the Engineer. No additional costs shall be allowed, or claim entertained for the cost of the Contractor (including the sub-contractors / manufacturer representatives) to come back site for the corrections of the snags or the follow-up functional testing. The TOP shall only start once the Engineer re-tested the plant and passes the plant.

Should the Engineer be call to site for the functional testing and the plant is not ready, or if Engineer needs to re-test the plant due the plant (or part of it) being failed by the Engineer, the cost for the Engineers trip shall be for the Contractor's account.

C3.2.1.3.5 Trial Operation Period:

Once the plant was commissioned to the satisfaction of the Engineer passing the Functional Testing, the Trial Operational Period shall start and shall consist out of continuous period of operation, free of any troubles, for 28 days. The first day of the trial operation period shall be taken as the next calendar day after the date of the successful functional testing.

For the entire duration of this period, the Contractor shall have a competent person on call and will aid the Employer's operators to operate the installation. The Contractor must be able to be on site within six (6) hours from when the Contractor was notified of an issue or fault by the Employer.

The Contractor shall inspect the installation on site on days 7, 14, 21 and 28 of the TOP to make fine adjustments and record the operational set points. During this time, the Contractor will also provide further training the Employer's staff for the operation and maintenance of the plant. The ownership, responsibility and liability of the plant stay the with the Contractor for the duration of the Trial Operation Period up to the issuing of the Taking-Over Certificate.

With the occurrence of any alarm, fault or defect, the Trial Operational Period shall re-start once the alarm, fault or defect was rectified. No additional costs will be granted to the Contractor for correction of any alarms, faults or defect or the extended operational periods, and all cost involved, including possible penalties, shall be for the account of the Contractor.

The Contractor shall submit performance reports by close of business on days 8, 15, 22 and 29 (the day after the plant was visited) to the Engineer indicating the current set – and operational points as well as trends of the following information:

- Individual equipment run periods.
- Measuring of voltages and currents
- Flow
- Logging of all alarms, faults and defects
- Photo report of all equipment showing close-up detail of condition

NOTE: Should the Contractor not submit the performance reports within 6 days after the inspection date (by close of business on days 13, 20 and 27), the Trial Operating Period shall be failed and restart as it would be taken that a fault or alarm has occurred. It will not be the responsibility of the Engineer to follow up with more than once with the Contractor should a report be late. Unless otherwise communicated by the Engineer, the start date of the new TOP shall only start once the Contractor confirmed in writing that there is no faults or alarms present at the time.

At the end of the Trial Operational Period, the Engineer shall inspect the plant in conjunction with the Contractor and Employer, with the purpose of taking over of the works in terms of Clause 10 of the Contract Conditions. The Engineer shall only be requested for inspection of the installation once the period is successfully completed without any alarms or faults and the final O&M manuals is submitted to and approved by the Engineer.

The Contractor shall allow for all costs required for Labour, Plant and Material to complete the TOP, including travelling costs, time required to complete the reports, etc.

C3.2.1.3.6 Tests on Completion After the Trial Operation Period:

At the end of the Trial Operational Period, the Engineer shall inspect the plant in conjunction with the Contractor and Employer, with the purpose of taking over of the works in terms of Clause 10 of the Contract Data.

The Contractor will be required to make suitable arrangements for demonstrating the plant and equipment supplied under this contract in the presence of the Engineer or his representative, to prove it fully complies with the specification. Any or all of the test results must be demonstrated to the Engineer at his request.

A competent person per applicable discipline, including all specialist sub-contractors, fully conversant with all aspects of operation, must be present to carry out the demonstration.

The Employer's Taking Over shall only be done if the installation passed all tests and inspections by the Engineer and Employer, and achieve the requirements set out in the Scope of Works.

C3.2.1.4 OPERATIONAL SIGNAGE, INSTRUCTIONS AND OPERATIONAL AND MAINTENANCE MANUALS

C3.2.1.4.1 Operational signage and instructions

The Contractor shall supply and install operational and health and safety signage and instructions for each installation. Signs shall be 3mm thick white, UV resistant Perspex as per Kontra Signs or similar and equally approved. Signs shall be installed on the walls of the plant rooms by means of PVC fisher plugs and Stainless-Steel coach screws. All symbols shall comply with SANS 1186.

Provision shall be made for the following signage at each building:

- A-recycle pump skid):
    - "Danger: Equipment Starts Automatically"
    - "Warning: Rotary Machinery"

Warning / danger signs on the outside of building shall be minimum of 290 x 290 mm.

C3.2.1.4.2 Operational and Maintenance Manuals

The Contractor must prepare and supply manuals for the successful operation and maintenance of the installation. A draft of the manual must be submitted for approval before the functional testing of the plant prior to TOP. The draft must then be corrected, if required, and three sets of the manual must be submitted within 7 days of the start of the Trial Operation Period. Failure to submit the final manuals will cause an extension of the Trial Operation Period and therefore delaying the Hand-over of the installation to the Employer. Each set must include a USB memory stick with a soft copy of the complete O&M manual.

A functional testing and on-site inspection (period to start of the Trial Operation Period) will not be arranged if a first round of manuals has not been provided and commented on by the Engineer.

The Taking-Over Certificate will not be issued if the final manuals are not issued.

These manuals must contain the following information as a minimum:

Section 1 : System description

A comprehensive description of the system including schematic diagrams, where required for clarification.

Section 2 : Commissioning data

The results of all checks and measurements as recorded during the commissioning period must be included and be compiled in such a manner that every check and measurement is clearly defined.

Section 3 : Operating instructions

3.1 Pre-start checklist for each individual plant.

3.2 Starting and stopping instructions.

3.3 Plant running checklist.

3.4 Safety precautions to be taken.

3.5 Manual operation.

3.6 Operator's duties.

3.7 Hydraulic design operating parameters.

Section 4 : Maintenance instructions

4.1 Schedule of maintenance particulars.

4.2 Part numbers of all replacement items.

4.3 Serial numbers of principal pieces of equipment.

Section 5: Mechanical equipment

The following information shall be provided for all Mechanical equipment:

5.1 Mechanical equipment schedule with make, model number, rating, commissioning setting and name, address and telephone number of supplier.

5.2 Maintenance instructions.

5.3 Manufacturer's brochures and pamphlets.

Section 6 : Electrical equipment

The following information shall be provided for all electrical equipment whether MV, MCC, PFC or field mounted.

6.1 Electrical equipment schedule with make, model number, rating, commissioning setting and name, address and telephone number of supplier.

6.2 Maintenance instructions.

6.3 Manufacturer's brochures and pamphlets.

Section 7 : Instrumentation, control and energy system

7.1 Description of each individual control system.

7.2 Control equipment schedule with make, model number, rating, commissioning setting and name, address and telephone number of supplier.

7.3 Manufacturer's brochures and pamphlets.

7.4 Maintenance instructions.

7.5 All setpoints, system settings and protection values in tabular format as per final installed system

Section 8 : Telemetry and SCADA

8.1 Description of each individual outstation including make, model number, rating, commissioning settings and name, address and telephone number of suppliers.

8.2 SCADA screenshots, parameter setpoints and basic control functionality.

8.3 Manufacturer's brochures and pamphlets.

8.4 Maintenance instructions.

Section 9 : Generator

Not Applicable

Section 10 : Drawings

Paper prints or reduced sized prints of all Contractor's drawings for all project components update to "as built" drawings. All drawings shall be formal CAD drawings with all information, dimensions and coordinates (if applicable) indicated on it.

The contract will be considered incomplete until all tests have been conducted to the satisfaction of the Engineer and all drawings and manuals have been handed over to the Engineer.

C3.2.1.4.3 TRAINING

The contractor must allow for and include any respective operation and maintenance training required for key management and operations personnel of the client of all components covered in the scope of contract and installation. Allowance shall be made for all critical subcontractor(s) to be part of the presenting team in order to do training on their scope of works.

The training must be conducted for a minimum of one day during the commissioning of the installations and repeated once more during the Trial Operation Period for another training session to reinforce the training done. The Operation and Maintenance Manuals must be used as the basis for the training and the training shall include both theoretical and on-site practical training. An attendance register must be provided and signed at each training session, by all required and present members. It must be included into the O&M Manuals.

All associated costs involved with the training sessions must be allowed for, including the time and cost of the persons presenting, the training material etc.

C3.2.1.5 DEFECTS LIABILITY PERIOD AND FINAL INSPECTION

After the 1 year/12 month defects liability/warranty period, a final meeting and equipment inspection will be held. Should all inspections prove successful, a final completion certificate will be issued to the contractor and any retention money will be approved and released for payment, the original guarantee returned, culminating in the successful completion of the project.

C3.5 MANAGEMENT

C3.2.2 CONSTRUCTION PROGRAMME AND PLANNING

The Contractor shall submit his programme of work to the Engineer not later than 14 days after the Contractor has been notified of the acceptance of his tender and only after discussions with the Engineer. The Contractor shall furthermore carefully consider the expected wet weather conditions during winter and plan the work and working methods to limit any possible standing time or delay. The Due Completion date and any "float" must be indicated by the Contractor on the programme. Should the Due Completion date not be indicated, the Due Completion date, in the opinion of the Engineer, shall be accepted as correct and binding. If necessary, the Engineer may instruct the Contractor to adjust his programme to suit other activities.

The Contractor shall deliver the programme to the Engineer's offices and shall include:

- 2 colour paper copies
- In electronic MS Project format.

The programme shall not be in the form of a bar chart only, but shall clearly show the anticipated quantities and value of work to be performed each week.

If, during the progress of the work, the quantities of work performed per week fall below those shown on the programme, or if the sequence of operations is altered, or if the programme is deviated from in any other way, the Contractor shall, within one week of being notified by the engineer, submit a revised programme.

If the programme has to be revised by reason of the Contractor falling behind his programme, he shall produce a revised programme showing how he intends to regain lost time in order to ensure completion of the works within the time for completion as defined in clause 1.1.86 of the General Conditions of Contract or any granted extension of time. Any proposal to increase the tempo of work must be accompanied by positive steps to increase production by either providing more labour and equipment on site, or using the available labour and equipment in a more efficient manner.

Failure on the part of the contractor to submit or to work according to the programme or revised programmes shall be sufficient reason for the engineer to take steps as provided in clause 15.1 of the General Conditions of Contract.

The approval by the engineer of any programme shall have no contractual significance other than that the Engineer will be satisfied if the work is carried out according to such programme and that the Contractor undertakes to carry out the work in accordance with the programme. It shall not limit the right of the Engineer to instruct the contractor to vary the programme should circumstances make this necessary. The Contractor is also referred to clause C3.4.20 when drawing up his programme.

The tenderer must make provision in his programme and tendered rates for the following constraints in working hours and working methods : (This list is not exhaustive and it is accepted that all other constraints were identified by the Contractor during the site inspection)

(1) Approval Periods for Working Drawings (specifically for the Mechanical and electrical items must be taken into account.
(2) Long Lead items for the Mechanical and electrical works must be indicated and sufficient time allowed for manufacture and delivery to site. The programme must show critical order dates for the equipment.
(3) The existing waste water treatment works must remain operational while works are under way. This means that tie ins must occur during low flow periods (i.e. at night) or alternative arrangements such as bypass or over pumping must occur. If over pumping is chosen by the contractor this will be at his own expense.
(4) The requirements of the Environmental Management Plan as well as the Health and Safety must be adhered to when work is planned. Strict monitoring of compliance will be implemented and actions will be enforced should non-compliance be encountered.

The project is funded over two financial years (2026/2027 and 2027/2028). The Contractor shall plan the work accordingly.

Penalty amounts as stipulated above will be deducted from payments due to the Contractor for failure to comply with the time periods stipulated.

No additional payment will be payable to comply with time restrictions and any additional cost must be included in the rates tendered for the work.

The Contractor must submit on a monthly basis a progress report consisting of a short report on the progress, project constraint implications (Time, cost, quality, risks, resources) and progress shall be indicated on the approved programme for each activity.

The progress report must be submitted 2 Days before site meetings and must accompany payment certificates to ensure the processing of payment.

C3.2.2.1 *General Allowances*

When drawing up his programme, the Contractor shall, take into consideration and make allowance for, inter alia:

- expected weather conditions and their effects,
- known physical conditions or artificial obstructions,
- searching for, dealing with and carrying out alterations to the existing services,
- the accommodation of public access and traffic,
- the provision and implementation of the health and safety plan in terms of the Construction Regulations, 2003 of the Occupational Health and Safety Act, and
- the design, testing and approval of the concrete mixes.

C3.2.2.2 *Reporting Requirements*

The Contractor shall promptly submit the schedules and reports at Contract stage as requested by Engineer. Updated reports must be submitted to the Employer's Agent two days before site meetings. Should the Contractor fail to provide the necessary documentation, the Employer's Agent may proceed to compile such documentation which costs will be deducted from payments due to the contractor and an additional amount of R1 000 will be deducted from payments due to the contractor for failure to provide the documentation 2 Days before the site meeting.

The report shall include the following:

- Bar chart or sloping bar chart schedule showing staff requirements by time interval and reflecting work planned by time interval.
- A monthly report showing planned progress versus actual progress giving details of how the Work will be completed in relation to the schedule.
- Daily major construction equipment report
- Daily staff report by crafts
- Procurement schedule for the procurement and receipt of materials, equipment and subcontract services by Contract and a monthly status report of all such materials and equipment
- Project Labour Report including employment details, name, ID no, employment dates, renumeration and expenditure of the main contractor and all sub-contractors.
- Value of work completed by QSE or SME subcontractors

C3.2.3 CONTRACTOR'S RESPONSIBILITY IN TERMS OF THE OHS ACT

The Contractor shall be responsible for complying with the Occupational Health and Safety Act, Act 85 of 1993, and specifically the Construction Regulations 2003 issued in terms of Section 43 of the Act (GNR 1010 of 18 July 2003) as amended.

The Contractor is referred to Part T1.2 Tender Data and the Health and Safety Specification (see Part C3.5.8 and PHS Particular Specification : Occupational Health and Safety) in this regard.

C3.2.4 UNAUTHORIZED PERSONS

The Contractor shall keep unauthorized persons from the Works at all times.

C3.2.5 MANAGEMENT MEETINGS

C3.2.5.1 Technical Meetings

Technical meetings shall be held on an ad-hoc basis as required either by the Employer's Agent or the Contractor.

The Contractor shall arrange for the Contractor's contract manager and the Contractor's site construction manager to attend these meetings.

C3.2.5.2 ***Site Meetings***

Site meetings shall be held monthly.

C3.2.5.3 ***Health and Safety Meetings***

Health and Safety Meetings shall be held monthly.

C3.2.6 MONTHLY STATEMENTS, PAYMENT CERTIFICATES AND ELECTRONIC PAYMENTS

The statement to be submitted by the Contractor in terms of Clause 14.3 of the Conditions of Contract shall be prepared by the Contractor at its own cost, strictly in accordance with the standard payment certificate format prescribed by the Employer's Agent in digital electronic computer format. The Contractor shall, together with a copy of the digital electronic computer file of the statement, submit TWO (2) A4 sized paper copies of the statement. The Contractor must submit the payment certificate in Excel or Bill format as instructed by the Employer's Agent. All supporting calculations of each quantity must be submitted with each payment certificate, sufficiently broken down into various portions of the work to enable the Employer's Agent to verify the quantities.

For the purposes of the Employer's Agent's payment certificate, the Contractor shall subsequently be responsible, at its own cost, for making such adjustments to its statement as may be required by the Employer's Agent for the purposes of accurately reflecting the actual quantities and amounts which the Employer's Agent deems to be due and payable to the Contractor in the payment certificate.

The Contractor shall, at its own cost, make the said adjustments to the statement and return to the Employer's Agent within THREE (3) normal working days from the date on which the Employer's Agent communicated to the Contractor the adjustments which requires, FIVE (5) sets of A4-sized paper copies of such adjusted statement, together with a copy of the electronic digital computer file thereof.

Any delay by the Contractor in making the said adjustments and submitting to the Employer's Agent the requisite copies of the adjusted statement for the purposes of the Employer's Agent's payment certificate will be added to the times allowed in terms of Sub-clause 14.6 of the Conditions of Contract to the Employer's Agent for submission to the Employer and the Contractor of the signed payment certificate and to the period in which the Employer is required to make payment to the Contractor.

C3.2.7 KEY PERSONNEL

The Contractor shall provide a schedule of key personnel, with contact particulars and experience.

C3.2.8 HEALTH AND SAFETY

C3.2.8.1 *Health and safety requirements and procedures*

In terms of the provisions of Section 37(2) of the Occupational Health and Safety Amendment Act, 1993 (Act 85 of 1993), hereinafter referred to as the Act, the following arrangements and procedures shall apply between the Contractor and the Employer to ensure compliance by the Contractor with the provisions of the Act:

(ii) The Contractor undertakes to acquaint the appropriate officials and employees of the Contractor with all relevant provisions of the Act and the Regulations promulgated in terms of the Act.

(iii) The Contractor undertakes that all relevant duties, obligations and prohibitions imposed in terms of the Act and Regulations on the Contractor will be fully complied with.

(iv) The Contractor accepts sole liability for such due compliance with the relevant duties, obligations and prohibitions imposed by the Act and Regulations and expressly absolves the Employer from himself being obliged to comply with any of the aforesaid duties, obligations and prohibitions, with the exception of such duties, obligations and prohibitions expressly assigned to the Employer in terms of the Act and its associated Regulations.

(v) The Contractor agrees that any duly authorised officials of the Employer shall be entitled, although not obliged, to take such steps as may be necessary to monitor that the Contractor has conformed to his undertakings as described in paragraphs (i) and (ii) above, which steps may include, but will not be limited to, the right to inspect any appropriate site or premises occupied by the Contractor, or any appropriate records or safety plans held by the Contractor.

(vi) The Contractor shall be obliged to report forthwith to the Employer and Employer's Agent any investigation, complaint or criminal charge which may arise as a consequence of the provisions of the Act and Regulations, pursuant to work performed in terms of this Contract, and shall, on written demand, provide full details in writing, to the Employer and Employer's Agent, of such investigation, complaint or criminal charge.

(vii) The Contractor shall furthermore, in compliance with Construction Regulations 2003 (Government Gazette 37305 and Regulation Gazette 10113 of 7 February 2014) to the Act acquaint himself with the requirements of the Employer's health and safety specification as laid down in regulation 4(1)(a) of the Construction Regulation 2014, and prepare a suitably and sufficiently documented health and safety plan as contemplated in regulation 7(1)(a) of the Construction Regulation 2014 for approval by the Employer or his assigned agent. The Contractor's health and safety plan and risk assessment shall be submitted for approval, to the Employer or his agent, within 14 days of the Commencement Date and shall be implemented and maintained from the commencement of the Works.

The Contractor shall at all times be responsible for full compliance with the approved plan as well as with the Construction Regulations and no extension of time will be considered for delays due to non-compliance with the abovementioned plan or regulations.

(viii) The Employer, or his assigned agent, reserves the right to conduct periodic audits, as contemplated in the Construction Regulations 2014, to monitor that the Contractor is compliant in respect of his obligations. Failure by the Contractor to comply with the requirements of these Regulations shall entitle the Engineer, at the request of the Employer or his agent, to suspend all or any part of the Works, with no recourse whatsoever by the Contractor for any damages incurred as a result of such suspension, until such time that the Employer or his agents are satisfied that the issues in which the Contractor has been in default have been rectified.

(ix) The proposed type of work, materials to be used and potential hazards likely to be encountered on this Contract are detailed in the Parts C3.4 and C3.5, the Bill of Quantities, the Drawings, and in the Employers' health and safety specification (regulation 5(1)(b) of the Construction Regulations 2014), which is contained in the Particular Specifications.

Payment items are included in the Bill of Quantities to cover the Contractor's cost for compliance with the OHS Act and the abovementioned regulations.

C3.2.8.2 Health and Safety Plan

Without limiting his obligations and liabilities in terms of the Construction Regulations, 2003 of the OHS Act, the Contractor, in his Health and Safety Plan to be submitted in terms of the Contract Data, shall inter alia deal with the safety provisions he will set up in respect of the aspects specified in the Specifications.

The Health and Safety Plan shall be neatly set out in a lever-arch type file, with labelled dividers for each section.

A copy of the approved Health and Safety Plan shall be kept on Site and made available upon request.

C3.2.8.3 *Protection of the public and Employer's staff*

The Contractor shall at all times ensure that his operations do not endanger any member of the public, or the Employer's staff.

Open excavations and other hazardous conditions on site shall be barricaded and precautions shall be taken to protect the public from the same in terms of the OHS Act.

The Contractor shall direct, control, facilitate and safeguard all pedestrian traffic during construction of the Works, provide all notices, and arrange for watching and lighting in accordance with the requirements of the relevant authorities.

C3.2.8.4 Excavations

Without limiting his responsibility for the safety of his workers in any excavation, the Contractor shall ensure the safety of his workers in trenches and excavations deeper than 1,0 m. in terms of the provisions of the OHS Act and the Construction Regulations. The Contractor may choose to batter excavations to a safe slope if sufficient space is available, or adequately shore the excavations.

C3.2.8.5 Working and entering confined spaces

Confined space is defined in the Occupational Health and Safety Act, Act 85, 1993, as an enclosed, restricted, or limited space in which, because of its construction, location or contents, or any work activity carried on therein, a hazardous substance may accumulate or an oxygen-deficient atmosphere may occur, and includes any chamber, tunnel, pipe, pit, sewer, container, valve, pump, sump, or similar construction, equipment, machinery or object in which a dangerous liquid or dangerous concentration of gas, vapour, dust or fumes may be present.

(a) Hazardous conditions in confined spaces could be identified as:

Hazardous atmosphere*:*

- *Too little or too much Oxygen (too little can cause brain damage and cause the heart to stop and too much increases the risk of fire or explosion)*
- *Presence of Toxic gasses*
- *Liquids or solids inside the confined space. Liquids may produce hazardous atmosphere when it evaporates e.g. fuel*
- *Type of work done inside the confined space. Activities can lead to the release of harmful substances e.g. grinding, descaling etc.*
- *Contamination from outside/adjacent sources. A contaminant could enter the confined space through porous walls, communicating openings e.g. sewers*

Explosive atmospheres:

- *High concentration of Oxygen (>23%),*
- *Fuel e.g. Acetylene gas from leaking welding equipment;*
- *Methane gas and hydrogen sulphide produced by rotting organic waste in sewers;*
- *Hydrogen gas produced by contact between aluminium or galvanized metals and corrosive liquids;*
- *grain or coal dust;*
- *solvents such as acetone, ethanol, toluene, turpentine, and xylene which may be introduced into the space through spills) and*
- *Ignition sources e.g. open flames, welding arcs, chemical reaction, arcing of electrical motors etc.)*

Physical hazards

- *Loose and unstable material may lead to trapping or burying workers*
- *Slip, trip and fall hazards*
- *Falling objects from above*
- *Moving parts of equipment and machinery*
- *Electrical shock from defective extension cords, welding cables etc.*
- *Poor visibility*
- *Temperature extremes*
- *Noise*
- *Risk of drowning*
- *Rusted railings*

(b) Safe work procedures for Confined Spaces shall include:

Only enter confined space after the air has been tested and evaluated by a competent person who has certified in writing that the space is safe and will remain safe for the duration of the work. Where the confined space cannot be certified as safe steps must be taken to ensure that any confined space in which there exists or is likely to exist a hazardous gas, vapour, dust or fumes, or which has or is likely to have, an oxygen content of less than 20 per cent by volume, is entered by an employee or other person only when;
the confined space is purged and ventilated to provide a safe atmosphere therein and measures necessary to maintain a safe atmosphere therein have been taken; and

the confined space has been isolated from all pipes, ducts and other communicating openings by means of effective blanking other than the shutting or locking of a valve or a cock, or, if this is not practicable, only when all valves and cocks which are a potential source of danger have been locked and securely fastened by means of chains and padlocks.

In an instance where it's not possible to purge and ventilate the confined space, the following precautions must be taken:

the confined space is entered only when the employee or person entering is using breathing apparatus of a type approved by the chief inspector and, further, that ;
the confined space has been isolated from all pipes, ducts and other communicating openings by means of effective blanking other than the shutting or locking of a valve or a cock, or, if this is not practicable, only when all valves and cocks which are a potential source of danger have been locked and securely fastened by means of chains and padlocks any employee or person entering the confined space is using a safety harness or other similar equipment, to which a rope is securely attached which reaches beyond the access to the confined space, and the free end of which is attended to by a person referred to in paragraph (c);

at least one other person trained in resuscitation is and remains in attendance immediately outside the entrance of the confined space in order to assist or remove any or persons from the confined space, if necessary; and
effective, approved apparatus for breathing and resuscitation is available immediately outside the confined space.

Ensure that everybody vacate the confined space after completion of any work therein. Where the hazardous gas, vapour, dust or fumes are of an explosive or flammable nature, further steps must be taken to ensure that such a confined space is entered only if –

- the concentration of the gas, vapour, dust or fumes does not exceed 25 per
- cent of the lower explosive limit of the gas, vapour, dust or fumes concerned
- where the work to be performed is of such a nature that it does not create a
- source of ignition; or
- such concentration does not exceed 10 per cent of the lower explosive limit of
- the gas, vapour, dust or fumes where other work is performed

Employees required to work in confined spaces must be trained and competent in confined space procedures. Working alone in a confined space is not permitted. A Confined Space Entry Permit is required for entry prior to any work performed in a confined space. A suitably trained person must undertake a written risk assessment before carrying out work involving entry into a confined space. The assessment shall take into account the following:

- the nature of the confined space;
- the work required and the methods by which the work can be done;
- the hazards involved and associated risks;
- implementation of control measures;
- the emergency and rescue procedures.

The risk assessment must be signed by all the people involved in the work to be done in the confined space. Communication between people in a confined space must be established as well as communication with any stand-by staff located outside. Rescue procedures must be established before entry into any confined space which, include a stand-by person. If working under a contractor or client's entry permit, this must be reviewed by a suitably qualified Health and Safety Specialist person to ensure adequacy of risk assessment, control measures and safe working procedures before entry.

C3.2.8.6 Health and safety specialist

The contractor shall employ a health and safety specialist, with suitable and proven qualifications, either on full-time or part-time basis, for the duration of the Contract. This specialist shall assist with the preparation of the health and safety plan, shall provide on-going training for all construction staff (at least 1 hour per week whilst work on site is in progress, in

the form of weekly tool-box talks), and shall assist with the upkeep of the health and safety plan and associated regular inspections etc.

The requirement for a weekly presence on Site necessitates that the Health and Safety Specialist be based locally, at least for the period while the Contractor is working on Site (i.e. during delivery, installation, testing and commissioning).

C3.2.8.7 Monthly health and safety reports

The health and safety specialist required in terms of C3.5.7.6 shall submit a report to the Engineer at the monthly site meetings, detailing the state of health and safety on the site over the last month, new risk assessments added, potential new risks, new precautions taken, and summarising the results of various inspections required in terms of the health and safety plan, etc. If this report is not submitted at each monthly site meeting, the Engineer shall impose a fine of R5000.00 on the Contractor, in each instance.

C3.2.9 ENVIRONMENTAL MANAGEMENT

The Contractor will be responsible for managing his activities so that damage to the environment is minimised, as per the specifications contained within the Particular Specification attached in Part C3.11.

C3.2.10 FORMS FOR CONTRACT ADMINISTRATION

The Contractor shall submit two Days before Site meetings the information and required documentation listed in C3.5.1.2 Reporting Requirements above and with each monthly statement for payment the following updated returns:

- Design progress report for M&E works
- Project Labour Report
- Value of work completed by QSE or SME subcontractors

Payment Certificates can only be processed if the abovementioned information is provided. The Project Labour Report must include details of all labour (including that of sub-contractors) employed on this contract in the month in question.

C3.6 MECHANICAL

i) MECHANICAL SPECIFICATIONS FOR THE BONNIEVALE WTW UPGRADE

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Chapter 1

1.1 GENERALLY APPLICABLE SPECIFICATIONS

1.1.1 Detail Design and Drawings

As part of the tender document, contractors must provide high-level General Arrangement drawings of equipment offered, with their tender submission. Sufficient detail must be provided to modify the civil drawings to fit the mechanical equipment offered.
The Contractor shall allow in his rates and program for doing the detail design and drawings of the proposed equipment and the installation thereof. General arrangement drawings, detailed equipment specifications, Technical Write-ups of the and method statements of the installation shall be provided to the Engineer for approval, before the Contractor intends to place an order or commence manufacturing.

Also take note of the requirements set out in 0 regarding 1.2.29 Contractor's **Drawings**.

The Contractor shall make available to the Engineer his design calculations upon any request to do so. No calculations shall be considered propriety information.

1.1.2 Installation Method Statement & Programme

The Mechanical (& Electrical) Contractor shall have access to site for installation of equipment as per the conditions below:

i) The Contractor shall supply his detailed design drawings, calculations, equipment data sheets and quality assurance documentation for approval to the Engineer within 60 days of the Commencement Date.

ii) The Civil Contractor (others) may require details of the mechanical and electrical designs within 60 days of the Commencement Date of this contract to allow him time to complete all civil modifications within his contract period;

iii) Access to the structures for installation shall be granted **1 month** after the Commencement Date. Partial access may be given to certain portion at the discretion of the Engineer.

The Engineer retains the right to change the sequence of installations as required to coordinate it with the civil works. The Mechanical Contractor shall be flexible (within reason) to adapt his programme to be in synchronization with other contracts on site. No claims will be entertained for changes to the programme.

Where equipment is installed in relation to existing or new infrastructure, the Contractor shall verify all dimensional data provided by the employer in the specification, schedules and drawings prior to commencing with manufacturing or sourcing of equipment to ensure the proposed equipment is compatible with the actual state of the existing infrastructure. This shall be done by conducting a detailed dimensional survey of all existing structures that impact on the design of mechanical and electrical equipment.

The Contractor shall allow in his rates and program for installation and all temporary works required. Method statements shall be provided for approval by the Engineer and the Operator whenever an activity is foreseen that will affect the normal operation of the WTW.

Also take note of the requirements set out below in the Mechanical Specification: 0 1.2.5 **nstallation** and 0 1.2.30 Contractor's Responsibility With Regard To Civil **Works**.

1.1.3 Performance Testing

Performance Requirement/Test

Equipment shall be tested for its ability to operate and perform as specified and for its performance on its own and in relation to the complete system. Equipment-specific performance tests are included in some of the detailed equipment specifications.

Failures to Pass Tests on Completion

When the equipment supplied and/or installed by the Contractor does not meet a specification or does not pass a performance test, clause 9.4 *Failures to Pass Tests on Completion* of the FIDIC General Conditions of Contract shall apply.

Works testing

Prior to shipment to site, equipment shall undergo an inspection at the factory:

i) To ensure material and welding / jointing compliance;

ii) To ensure corrosion protection compliance;

iii) Visual and final inspection before shipment;

iv) Performance test (as far as possible at factory).

Before commissioning

i) Contractors shall take note of Sections 0 to 0 in the Mechanical Specification, prior to starting commissioning;

ii) Tests for correct operation of all motors;

iii) Tests for correct operation of control gear;

iv) Submit all certification, motor test certificates, material certificates;

v) Submit all operating and maintenance instructions.

Commissioning tests

Generally, the equipment will be considered acceptable at commissioning when all of the following conditions are satisfied:

i) The equipment meets the duty requirements as defined in this Section of the Specification;

ii) Any other specific performance tests defined in this Section prove acceptable operation of the equipment;

iii) The power absorbed by each motor at duty point does not exceed the values stated in the Technical Data Sheets by more than 5%;

iv) The vibration measured at each point does not exceed the level prescribed in BS 4675 Part I – 1976 for the appropriate class of machine;

After commissioning

Check equipment for proper functioning and monitor process performance during the Test Period and the Operational Acceptance Period (see Sections 0 to 0 of the Mechanical Specification). For the purposes of this contract, the Test Period shall be deemed to be 72 (seventy-two) hours continuous trouble-free running and the Trial Operation Period (which shall commence after the Test Period) shall be 28 days. The performance of the equipment will be considered acceptable when the requirements as specified have been achieved consistently during the Trial Operation Period.

During Defects Liability Period

Check all equipment for correct operation and functioning at 3 months, 6 months, 9 months and 12 months after plant take-over.

i) Check and provide lubrication for equipment where required;

ii) Check corrosion protection of equipment and repair any damages not attributable to misuse;

iii) Adjust equipment and or settings, after consultation with and approval from operators in order to optimise equipment performance;

iv) Correct and/or repair any faulty equipment, switchgear, programming etc., within 48 hours of being notified.

Provide reports of the maintenance and testing done at these time intervals, within 2 weeks after the required inspection.

1.2 STANDARD SPECIFICATIONS

1.2.1 General

The Standard Specification for Mechanical Works (this Section) shall apply wherever it is relevant to the Contract unless it is superseded in accordance with the precedence stated and, in particular, by the Detailed Mechanical Specification.

1.2.2 Environment

The site shall be considered as coastal with some industrial pollution. For the purposes of this Specification, the site shall be regarded as a severe marine environment with some industrial pollution.

Besides being coastal, treatment works have large open liquid areas which are aerated and/or
agitated and the environment is damp. The high prevailing winds can also carry spray and foam not only from the plant but in some areas also from the sea.

This environment is very corrosive to ferrous metals and, where the use of such metals cannot be avoided, the metals must be adequately protected, such protection systems being designed for a life of at least 15 years.

1.2.3 Climatic Conditions

Barometric Pressure	101.3kPa
Summer	
Max. dry bulb temperature	36°C
Relative Humidity	20-30%
Wet bulb temp.	0°C
Max. dry bulb temperature – 24-hour average	22°C
Max. wet bulb temperature	23°C
Wind	Predominantly east to southeast
Max. hourly average	67km/h
Gusts up to	137km/h
Winter	
Minimum. dry bulb temperature	0°C
Relative Humidity	100%
Wet bulb temp.	0°C
Wind	Predominantly west to northwest
Max. hourly average	74km/h
Gusts up to	126km/h

1.2.4 Design

1.2.4.1 General

This Specification lays down the performance, quality and overall system requirements of the Works. Deviation from the Specification will only be considered if the Engineer considers such deviation an improvement.

1.2.4.2 Safety

Safety shall be an all-important and overriding consideration and proper attention shall be paid to this aspect at the design stage. The regulations of the Occupational Health and Safety Act, Act 85 of 1993, as amended, shall be strictly observed.

Equipment which is potentially dangerous shall be designed in accordance with a relevant South African or international Standard.

The following must be noted:

i) Hazards must be avoided or guarded. Nip points shall be guarded; sharp corners shall be rounded off; operating handles, supports and protrusions shall be kept clear of access ways; and so forth.

ii) The Contractor's Drawings and specifications shall clearly specify the structural requirements of the Works and the Contractor shall be responsible for covering all unsafe gaps and openings left in structures after installation.

iii) Moving parts shall be properly guarded to the satisfaction of the Engineer.

iv) An emergency stop button shall be installed in a convenient position next to each machine.

The installation shall be designed to provide immediate access without the danger of accidental operation. In addition, trip wires which will stop the driving motor when pulled shall be provided along the accessible side/s of moving conveyor belts, chains and the like irrespective of operating speed and irrespective of guards provided.

Installations considered unsafe by the Engineer shall be corrected by the Contractor at no cost to the Employer.

1.2.4.3 Design Aspects

A high quality standard is required and reliability, long life, trouble free operation, efficiency, ease of maintenance and operation, and neatness are essential.

All plant and equipment shall be of robust construction and the design shall, as applicable, be based on:

i) the full range of duties which can be reasonably anticipated;

ii) the power and torque transmitted by the driver system under full load and stalled conditions;

iii) the maximum pressure or vacuum which can be produced by pumps, blowers and compressors under all conditions including blocked or closed inlet and outlet circuits;

iv) conservative service and safety factors based on approved standards or laid down in the printed specifications of reputable and approved manufacturers;

v) a safety margin of at least 20 % in addition to any service or safety factors which apply;

vi) twenty four hour per day operation;

vii) a minimum life of 100 000 hours before repair or major part replacement;

viii) prevention of serious damage from normal operational problems such as blockages, blinding, jamming, seizure, malfunction and, as far as is practical, maloperation; if these occurrences cannot be avoided by good design.

Machines with non-overloading characteristics shall be selected wherever possible; eg: motors shall be sized so that they cannot be overloaded by the driven machine.

1.2.4.4 Fail-Safe Operation and Protections

Where damage can occur from normal operational or other foreseeable problems, plant, equipment and systems must be designed to be fail safe; i.e. must have built-in redundant elements, or be fail-to-safe; i.e. must return to a safe condition where no further damage can be done in the event of a failure, malfunction, maloperation, overload and, as far as practical, misuse. All reasonable and economically justifiable protections to prevent or limit damage to plant and equipment, particularly in high risk situations, must be incorporated. Protections shall:

i) be directed at the source of the problem, limit forces to safe levels and act quickly enough to prevent damage (electrical thermal type overloads are inadequate);

ii) stop or prevent from starting all equipment at risk;

iii) activate an alarm with a labelled indicator on the control panel whenever a protection operates;

iv) not permit unauthorised tampering;

v) operate reliably after long inactive periods exposed to corrosive and dirty conditions.

Tenderers shall highlight equipment limitations which can be exceeded during operation and cannot be guarded against.

1.2.4.5 Moving Parts

The following general requirements apply not only to machines but to all equipment with moving parts such as headstocks, extension spindles, swivelling davits, heavy duty hinges, pivots and the like:

i) All rotating or swivelling shafts, pins and the like, shall be adequately supported, guided and restrained by lubricated or self-lubricating bearings, collars and/or bushes.

ii) Swivelling joints on linkages and the like shall be of the "universal" or fork and rod type with bearings or bushes fitted to the eyes or forks.

iii) On abrasive applications abrasion resistant materials and slow speed operation shall be utilised. Raw sewage and sludge shall be regarded as very abrasive.

iv) All applications associated with wastewater shall be regarded as corrosive and materials of construction shall be selected to suit.

v) Susceptibility to fatigue failure shall be minimised by proper design and manufacturing procedures. In particular, changes in section shall be radiused and care must be taken to avoid the use of welded components in areas of fluctuating stress.

vi) The locking of nuts and pins in position shall be done to the approval of the Engineer.

vii) Wearing parts shall be designed for interchangeability and ease of removal and replacement.

1.2.4.6 Arrangement and Mounting

The arrangement and general design shall take the following requirements into consideration:

i) Lifting eyes, lugs, hooks, etc., shall be provided on heavy or large items to facilitate handling.

ii) Castings or fabrications shall have machined pads for seating and be mounted on either soleplates or baseplates as appropriate.

iii) Where accurate alignment is required, positioning pins and/or jacking screws shall be provided.

iv) The needs of operation and maintenance including neatness, access, working space, safety, cleaning, adjustment, handling, assembly, alignment, disassembly, removal, etc.

v) With plant and equipment to be mounted on or against concrete or brick structures built by others, provision shall be made for adjustment in the mechanical design. Any special accuracy requirements must be specified on the Contractor's Drawings.

1.2.4.7 Prevention of Corrosion

The Contractor shall review all designs from a corrosion protection point of view prior to commencing work. Any details which might have a negative effect on the corrosion protection and the future application of coatings are to be brought to the Engineer's attention for a ruling prior to commencement of work.

1.2.5 nstallation

1.2.5.1 General

The Works shall comply with the following:

i) When erected and installed, the plant and equipment shall be of neat and workmanlike appearance, solidly and evenly supported, true to line, level, plumb and in proper working order.

ii) The requirements of Sub-clause "Arrangement and Mounting" (see Clause "Design") must be noted.

iii) The Contractor shall provide all foundation bolts, supports, hangers, brackets, etc. required for the support and fixing of equipment.

iv) The Contractor is not responsible for grouting puddle pipes which pass through liquid retaining walls or slabs but shall be responsible for all other grouting necessary for all plant and equipment.

v) The use of more than three shims in the alignment of equipment will not be permitted. Machined spacers shall be prepared where necessary. Shims and spacers shall be of a corrosion resistant material such as stainless steel.

vi) Corrosion protection requirements shall be carefully attended to and the relevant paragraphs of Sub-clause "Paint Application" (see Clause "Corrosion Protection : Paint Coatings) must be noted. All mating faces must be coated before and sealed after assembly.

vii) A small amount of a nickel-based, anti-seize compound shall be applied along the full length of fastener threads before the nut is applied.

viii) Crevices which are formed between two metal surfaces shall, prior to final fastening, be filled with a suitable formable packing, Denso tape or equivalent, or with a suitable mastic or sealant.

1.2.5.2 Alignment of Shafts

Shafts for drives, such as motors, with an output above 150 kW shall be aligned to the driven shaft as follows:

i) Final alignment shall be done after installation and before commissioning and shall be checked in the presence and to the approval of the Engineer. Alignment shall be sufficiently accurate to ensure that no initial pre-load is placed on the shaft coupling.

ii) Each motor shall be aligned to its pump by alignment specialists using laser aligning equipment with real time computer display.

iii) The use of pourable epoxy resin chocks (Epocast 36, Chockfast or equivalent) shall be acceptable. If pourable chocks are used, the baseplate feet do not have to be machined but each machine foot shall be provided with a screw for vertical alignment. The chock thickness shall not be less than 20 mm.

1.2.6 Materials

1.2.6.1 General

All materials used in the manufacture and construction of plant and equipment shall be new, unused and shall be the best of their respective kinds. The Contractor shall ensure that the materials are selected in accordance with the best engineering practice to suit the working conditions and the extremely corrosive environment.

1.2.6.2 Steel

All structural steel shall comply with the requirements of SANS 1431 grade 300W and shall be legibly marked with the maker's name or trade mark and identification marks.

1.2.6.3 Stainless Steel

The AISI grade of stainless steel to be used will normally be specified in the Detailed Mechanical Specification. Unless otherwise specified, rolled material shall be supplied with a matt, annealed and pickled or otherwise de-scaled surface finish. For wrought steels, the equivalent BS 970 grade may in each case be used.

The common applications are as follows:

Application	AISI	BS 970
Treatment Works (All applications)		
Welded	316L	316S12
Not welded	316	316S16
Low Corrosion Interior		
Welded	304L	304S12
Not welded	304	304S15
Exterior and Corrosive Interior		
Welded	316L	316S12
Not welded	316	316S16

A manufacturer's test certificate shall be provided for each batch of stainless steel giving details of the material analysis and any mechanical tests carried out on the material. Each stainless steel item supplied shall be clearly and permanently marked with the grade of stainless steel and cross-referenced to the applicable test certificate.

Where grades 316 and 304 are mentioned in the Tender Documents:

i) these shall be taken synonymously with grades 316L and grade 304L, respectively.

ii) Contractors may offer grade EN 1.4162 in place of grades 316 and 304.

1.2.6.4 3CR12

This is the titanium stabilised, 12 % chrome steel as produced by Columbus Stainless, South Africa.

3CR12 shall always be supplied with an annealed and pickled finish. 3CR12, in cases where it is to be coated, shall be suitably abrasive blasted to ensure adherence of the prime coat.

1.2.6.5 Plastics

Thermoplastics and fibre reinforced polymers shall be UV resistant, have adequate tensile strength and high impact strength and generally suit the application.

PVC is regarded as too brittle and shall not be used unless called for in this Specification or approved in writing by the Engineer before supply.

1.2.7 Castings

Castings shall comply with the relevant South Africa or British Standard for the material used, including the following:

Grey Cast Iron	SANS 1034	BS 1452

S. G. Iron	SANS 936/7	BS 2789
Steel (General Purpose)	SANS 1465	BS 3100
Aluminium	SANS 989/992	BS 1490
Copper and Copper Alloy	SANS 200	BS 1400

Particular attention shall be paid to cleanliness, soundness and neat fettling and dressing of castings. Surfaces shall be smooth and irregularities caused by mould washaways, and the presence of porosity and sand and slag inclusions will not be tolerated. Areas under bolt heads, nuts and washers, shall be machined or spot faced to ensure a flat and smooth pressure bearing area, and sufficient space shall be provided for the use of ring or socket spanners.

All pressure retaining castings shall be hydrostatically tested to not less than 1,5 times the maximum working pressure after machining and shall be pressure tight.

No repairs shall be undertaken to castings without the written permission of the Engineer and **welding will not be permitted on cast iron castings.**

Castings shall be heat treated to provide optimum corrosion resistance and toughness combined with reasonable machinability. In particular stainless steel castings shall be heat treated so as to ensure that all carbides are in solution, to ensure optimum grain size, and to provide maximum corrosion resistance.

The Contractor shall provide a test certificate for each casting or batch of castings, except for those made of grey cast iron, giving details of the material analysis, the heat treatment and any mechanical tests carried out.

1.2.8 Fabrication of Carbon Steels

Steelwork shall be constructed, fabricated and erected in accordance with SABS Standard Building Regulations, Chapter 6, "Structural Steelwork", and with SANS 1200 H where applicable.

1.2.8.1 Finish

Edges shall be rounded to a radius of at least 2 mm.

Weld spatter and other protrusions shall be removed.

1.2.8.2 Requirements for Corrosion Protection

In addition to finishing requirements, the requirements of corrosion protection application shall be taken into consideration. Surfaces must be accessible for surface preparation and coating.
Inaccessible pockets and open hollow sections and similar hidden surfaces shall not be permitted unless the corrosion protection system specified for the fabrication is hot-dip galvanizing without painting.

Pits, undercuts, indentations, etc. which would prevent access to blast material are unacceptable.

1.2.8.3 Drawings

General and detailed fabrication drawings shall be submitted by the Contractor for approval by the Engineer. Full details of the welding procedures and standards which he proposes to use shall be shown on these drawings.

1.2.8.4 Inspections

The Contractor shall arrange for the Engineer to inspect fabrications, including fabricated pipework, in the fabrication workshop and prior to corrosion protection.

1.2.9 Fabrication of Stainless Steel

The requirements regarding the fabrication of carbon steels applies to the fabrication of stainless steel as well. In addition, the following requirements apply to the fabrication of stainless steels:

i) Fabrication of stainless steels and 3CR12 shall follow the recommendations in "The Stainless Steel User Manual" and "The 3CR12 Fabrication Guide" issued by Columbus Stainless. Only fabricators experienced with stainless steel will be considered acceptable. Such fabricators shall use permanently dedicated storage and fabrication areas and shall use machines, tools and handling equipment suited and permanently dedicated to this type of material.

ii) Surfaces which become contaminated with steel or otherwise stained or otherwise marked so as to be of uneven colour, shall be cleaned by pickling or electro-cleaning rather than by grinding.

iii) The Contractor shall arrange for the Engineer to inspect fabrications, including fabricated pipework, in the fabrication workshop.

1.2.10 Welding

1.2.10.1 General Welding Requirements

Standards

Standards complying with good modern practice, and acceptable to the Engineer, shall be adopted. These include the following:

BS EN 1011 - Arc welding carbon and carbon manganese steelwork.
BS 4677 - Arc welding austenitic stainless steel pipework.
BS 2633 - Class 1 Arc welding of steel pipework.
BS 2971 - Class II Arc welding of steel pipework.
BS 806 - Design and construction of ferrous piping in connection with land boilers (used for arc welding specification of all pipe flanges).

Welders shall be experienced competent artisans approved in accordance with BS 4872.

Continuous Welding and Elimination of Crevices

Welding shall be continuous on all sides of any joint. All crevices, including those arising from welding on one side only, shall be eliminated. This requirement applies to the welding of all metals and, in this respect, it should be noted that welding deformation results from incorrect welding procedure rather than from continuous welding.

In special cases only, non-continuous welding might be approved in writing by the Engineer. The resulting crevices shall be sealed with either a coal tar product which can be applied at thicknesses of up to 1 000 µm such as Carboline Bitumastic 50 or equivalent; or a two part solvent free epoxy which can be applied at thicknesses of up to 600 µm such as Sigmaline 523 or equivalent.

Weld Appearances

Welding shall be free of blowholes, projections, pinholes, splatter and undercuts and all welding flux shall be removed. All weld spatter and other sharp imperfections shall be removed prior to abrasive blasting. Prior to painting, weld beads with a surface irregularity exceeding 3 mm or with sharp crests having a radius under 2 mm shall be ground. Weld grinding must not be performed on 304L or 316L stainless steel, however, unless unavoidable and in approval by the Engineer.

Site Welding

Site welding shall be kept to a minimum and shall only be undertaken with the approval of the Engineer.

1.2.10.2 Welding of Stainless Steel and 3CR12

The following applies in addition to all of the above.

Stainless Steel Welding

Stainless steels shall be welded strictly as recommended in "The Stainless Steel User Manual" issued by Columbus Stainless.

3CR12 Welding

3CR12 shall be welded strictly as recommended in "The 3CR12 Fabrication Guide" issued by Columbus Stainless.

Stainless Steel Type

Austenitic stainless steels to be welded shall be of the low carbon grade (i.e.: 304L, 316L, etc.).

Welding Rods

The welding rods used shall be the most suitable for the metal and purpose. Type 309 stainless steel welding rods shall be used for welding 3CR12 unless otherwise approved in writing.

Welders

Only welders experienced with welding stainless materials shall be used.

General

All possible steps shall be taken to ensure maximum corrosion resistance and strength of the welds and welded material. Special care shall be taken to avoid prolonged heating. Welds shall be passivated. Discolouration and steel contamination must be removed by pickling or electro-cleaning as approved by the Engineer but should rather be avoided by taking the appropriate measures.

1.2.11 Fasteners

1.2.11.1 Standards

Bolts and nuts shall be hexagon head type complying with SANS 1700 with threads of the coarse pitch series. Allen head screws of any type shall not be used without the Engineer's written consent.

1.2.11.2 Fasteners M12 and Smaller

All fasteners M12 and smaller shall be of grade 316 SS, or better.

1.2.11.3 Fasteners Larger than M12 - in Corrosive Areas

All fasteners in corrosive areas shall be of 316 SS, or better. Corrosive areas shall be taken to include any moist or wet area such as in and above settling tanks, in or in the vicinity of open channels, where a continuous spray can be expected and all internal and external areas in the vicinity of the inlet works of a wastewater treatment works. All fasteners embedded in brick, concrete or soil shall also be of 316 SS, or better.

1.2.11.4 Fasteners Larger than M12 - Non-Corrosive Areas

Fasteners larger than M12 which are in non-corrosive areas shall, except when specified otherwise, be hot-dip galvanized.

1.2.11.5 High Tensile Bolts

Where high tensile bolts are required by the design, they shall be hot-dip galvanized and painted.

The bolt holes and crevices shall be filled and sealed prior to painting.

1.2.11.6 Material Compatibility

Fastener material shall always be of equal or better corrosion resistance than the items being fastened, e.g. 316 SS bolts must be used to fasten together 316 stainless steel fabrications or flanges.

1.2.11.7 Washers

Washers of similar material to the bolts shall be provided under each nut and setscrew head. Multiple washers or shims shall not be used. Spring washers or other approved locking arrangement shall be used on all fasteners subject to vibration.

1.2.11.8 Anti-Seize Compound

Before assembly, threads shall be treated with a nickel based, anti-seize/corrosion protection compound; Chesterton 725: Nickel Anti-Seize Compound, or equivalent. The Contractor shall note:

i) Copper-based compounds are not acceptable and, if used, shall be cleaned off before the correct compound is applied.

ii) If it is found during inspection that compound has not been applied, the Contractor shall disassemble all fasteners and comply with this requirement.

iii) A small amount of compound shall be applied along the full length of the thread before the nut is applied. Excessive compound visible on the thread after the nut has been applied shall be cleaned off.

1.2.11.9 Thread Projection

Bolt threads shall project between 1 and 6 mm from the head of the nuts when fixed. Longer projections will only be allowed if the Contractor can show that bolts of a more suitable length are not manufactured.

1.2.12.1 Corrosion Protection

After installation the exposed surfaces of bolts not made of 316 SS or of EN 1.4162 shall be coated as for the items being fastened. If the use of Allen head or similar fasteners has been approved by the Engineer, the recessed heads shall be filled with a suitable non-hardening sealing compound.

1.2.12 Anchor Fasteners

1.2.12.1 Type and Material

All anchor fasteners shall be of grade 316 SS, or better.

Anchor fasteners for water retaining structures and for brickwork shall be of the chemical anchor fastening type. Anchor fasteners for other applications may be of the expanding type or chemical anchor type.

1.2.12.2 Hook Bolts

Grade 316 SS, or better, hook bolts shall be supplied and grouted by the Contractor into pockets which will be provided in the concrete structure in accordance with the information to be supplied by the Contractor. The grouting products shall be used strictly in accordance with the manufacturer's instructions.

1.2.12.3 Alternative Anchor Bolts

The use of 316 stainless steel "Hilti Kwik Bolt" stud bolts or equivalent may be used as an alternative where approved by the Engineer. If steel reinforcing bars are encountered while the holes are being drilled, the Contractor shall knock a hole in the concrete around the steel and grout in a stainless steel hook bolt as described above.

1.2.12.4 Through-Bolt Anchors

Where machinery is anchored by studs or bolts which extend through the supporting structure and is therefore fastened down with the use of nuts from both sides, these, together with associated washers and brackets, shall also be of grade 316 SS, or better.

1.2.12.5 Anti-Seize Compound

A small amount of a nickel-based, anti-seize compound shall be applied along the full length of fastener threads before the nut is applied.

1.2.13 Grid FLOORING

All platforms and stairways shall be constructed with a non-slip profile or finish.

Consideration may be given to use glass fibre grating only in applications of non-elevated heights and where theft is a potential problem. The grating shall be of open grating type and not less than 38mm in depth. The mesh size shall not be less than 38mm x 38mm and the resin shall be Vinyl Ester.

All elevated walkways and stairways shall be Mild Steel Hot Dipped Galvanised construction.

The depth of bearer bars in steel grid flooring shall not be less than 30 mm with a bearer bar pitch of not greater than 40 mm. The bearer bars shall be across the shorter span.

Panels shall be set level and fixed to angle frames to prevent rocking.

Cut-outs in grid flooring for pipes, valve spindles, etc. are to be made and banded before any corrosion protection is done. The edges of removable grid access covers must also be banded.

Grid flooring and frames shall be hot-dip galvanized after fabrication. Alternatively, a glass flake resin which is applied by dipping the flooring in catalysed resin, is acceptable; such as Power Blast's Vitaglass or equivalent. The grating shall be of open grating type and not less than 38mm in depth. The mesh size shall not be less than 38mm x 38mm and the resin shall be Vinyl Ester. All GRP type grating shall include an anti-slip coating. Painted coatings will not be acceptable.

Where grid flooring rests on painted surfaces, strips of rubber insertion material shall be secured under the grid to protect the paint.

The fixing clip set (saddle clamp and locking plate) shall be of hot-dip galvanised steel or stainless steel. All fasteners shall be of grade 316 SS, or better.

1.2.14 Guard Railing

1.2.14.1 General

Guard railing shall be provided in accordance with legislated requirements and shall be provided generally in positions where the vertical change in level is 1 000 mm or greater.

Guard railing shall comply with SANS 10104.

Fabrication and installation requirements are specified elsewhere in this Standard Specification for Mechanical Works (including General Works).

1.2.14.2 Guard Railing for Equipment Installations

Guard railing for equipment installations shall comply with the following specific requirements:

i) Guard railing shall be of grade 316 stainless steel and shall comprise hand and knee rails not less than 32 mm diameter and stanchions spaced at not more than 1,8 m except where specifically directed otherwise in writing by the Engineer.

ii) On platforms, walkways, landings or around dangerous areas the vertical height, measured from the top of the hand rail to the floor or surface, shall be at least 1 000 mm.

iii) On stairways and fixed ladders the rails shall be parallel to the strings, and the vertical height, measured from the top of the hand rail to the nosing of the tread, shall be at least 900 mm.

iv) For applications covered by this Specification, the rails and stanchion shall withstand, without permanent deflection, a proof force of 890 N and 1780 N respectively, applied at any point and in any direction. This requirement is in addition any strength requirement specified in SANS 10104. Contractors shall provide proof that their guard railing has been tested and withstands these loads.

v) No opening between rails shall allow the passage of a ball of diameter 600 mm.

vi) Stanchions and rails shall be smoothly finished and free from sharp corners, edges and projections which may injure persons or damage clothing. Stanchion bases shall have the corners rounded or sheared off.

vii) Welded guard rail installations are preferred. Installations which incorporate jointed sections shall be secure and without relative movement of the components under loading. “Pop” riveted installations will not be acceptable. Joints shall be smoothly finished, without corners.

viii) Railings shall be ended off with positively fixed closure bends. At corners, short radius bends with stanchions on both ends shall be employed or, alternatively, stanchions specifically designed for such a position shall be employed. No sharp endings will be permitted.

ix) Stanchions shall generally be base-mounted to suit the arrangement requirements and shall be of solid or welded construction. Welding shall be continuous and shall be smoothly finished and then passivated.

x) Stanchions which are hollow shall be self-draining.

xi) Stanchion feet which are attached to metallic surfaces shall have minimum dimensions of 150 mm X 60 mm X 8 mm. Two fasteners, of minimum size M16, shall be used to secure each foot. Neatly fitting packing, Denso tape or equivalent, shall be fitted under stanchion feet to prevent the formation of crevices.

xii) Stanchion feet which are attached to non-metallic surfaces shall have minimum dimensions of 150 mm X 150 mm X 10 mm. In instances where the horizontal surface to which the foot is to be fastened is less than 150 mm wide, the foot shall be designed to be seated on at least two surfaces. Four fasteners, of minimum size M16, shall be used to anchor the foot. Non-shrink, cementitious grout shall be applied under the foot just prior to final tightening of nuts.

xiii) A small amount of a nickel-based, anti-seize compound shall be applied along the full length of fastener threads before the nut is applied.

xiv) All components shall be supplied in the pickled and passivated condition which may also be polished. All surfaces must be uncontaminated and unmarked to ensure maximum corrosion resistance. A manufacturer's test certificate shall be provided for each batch of stainless steel giving the chemical analysis of the material.

xv) Where kickplates are required by legislation, these shall extend to 150 mm above the walkway level.

1.2.14.3 Guard Railing in Public Places

The requirements for guard railing at equipment installations shall also apply for guard railing for public places. The following specific requirements must also be complied with:

i) The structural design shall be done in accordance with the requirements of SANS 10104.

ii) No opening in guard railing installed in public places shall allow the passage of a ball of 100 mm diameter.

1.2.15 Permanent Ladders And Stairs

1.2.15.1 General

Permanent ladders shall comply, primarily, with the requirements of the OSH Act and, secondarily, with BS 5395. Stairs shall comply with BS 5395, Part 3.

Unless other materials are specified, ladders and stairs shall be of carbon steel and hot-dip galvanized after all fabrication has been completed.

Unless other materials are specified, bolts shall be hot-dip galvanised but anchor bolts in concrete and brickwork shall be of grade 316 SS, or better, and shall be no smaller than M16.

1.2.15.2 Permanent Ladders

Ladders shall comply with the following detail design aspects:

i) Access points to the head of ladders from platforms and walkways shall be protected by self-closing gates or by chains.

ii) No part of the ladders shall project into the passageway.

iii) The width between strings shall be between 380 mm and 450 mm.

iv) A minimum clear space of 230 mm must be allowed behind the rungs.

v) The diameter of the rungs shall be approximately 25 mm and these shall be formed from HT steel reinforcing bar.

vi) Additional rungs shall be provided in the same horizontal plane as the top rung in order to close the gap between the platform and the ladder. Sufficient rungs shall be provided to ensure a maximum gap of 75 mm. These top rungs shall be at the same level as the floor or platform to which access is being provided.

vii) Strings shall be formed from flat bar.

viii) The vertical distance between the ladder support brackets shall not exceed 1 800 mm.

ix) The strings shall extend to 1 100 mm above the floor or platform and shall be matched with any guard rail protections at this level. Connections between hot-dip galvanized steel ladders and stainless steel guard railing shall be bolted. Unless laterally supported by the guard rails, these strings shall be supported by vertical structural sections (not flat bar) whose footings shall comply with this Specification for guard rail stanchion feet.

x) All rises in a flight shall be uniform and the surface of the top rung shall be level with the top platform or landing. The height chosen for the rise shall be between 225 mm and 255 mm.

xi) Except on chimneys, the height of a ladder should not exceed 6 000 mm. Greater heights shall be provided with intermediate landings between each 6 000 mm ladder section.

xii) If the height between start and end levels is over 4 000 mm, the ladder shall be fitted with a safety cage. The safety cage shall extend at least 1 000 mm above the higher landing. The cage ”shall afford firm support along its whole length for the back of the person climbing the ladder, and for which purpose no part of the cage shall be more than 700 mm away from the level of the rungs.” (as per OHS General Safety Regulations). The cage shall comprise no fewer than seven vertical elements.

xiii) Strings, rungs and support members shall be of solid structural sections (e.g. flat bar, round bar, square bar, angles, etc.) and no hollow sections will be accepted for any part of the ladder.

1.2.15.3 Stairs

Stairs shall comply with BS 5395.

1.2.16 Baseplates

1.2.16.1 Baseplate Configuration

Both direct-coupled and belt-driven machines shall be mounted with their drivers on common cast iron or fabricated steel baseplates of rigid construction.

In applications where baseplates are not practical, machined soleplates, suitably fixed and grouted to the concrete plinths, shall be provided. No machine may be mounted directly onto a concrete base without the use of either a baseplate or soleplate.

1.2.16.2 Corrosion Protection

Steel baseplates shall be hot-dip galvanized unless specified otherwise in the Detailed Mechanical Specification.

1.2.16.3 Drainage

Baseplates shall be configured to prevent pooling of water. Baseplates shall be either fully grout filled or provided with drain holes in all side members.

1.2.16.4 Machined Mounting Pads

The baseplate shall incorporate machined mounting pads at the support and fixing positions of each item of plant and equipment to be mounted on the baseplate. On fabricated baseplates this machining shall be done after fabrication, stress relieving (if applicable) and hot-dip galvanizing are complete. The thickness of the mounting pads shall be not less than 1,25 times the diameter of the holding down bolts. The pads shall not be provided with threaded holes for machine screws but shall be drilled for inserting through-bolts and adequate provision shall made for reaching the nut with a suitable spanner. In the period between machining and installation of the equipment, the machined surface shall be protected against corrosion by a removable coating. After installation, a non-hardening compound, Tectyl or equivalent, shall be applied to exposed machined surfaces and to the crevice formed at the foot of the equipment.

The above design may be suitably modified if the Contractor uses a pourable resin based chocking system. Such chocks shall be at least 15 mm thick.

1.2.16.5 Shimming

Not more than three shims may be used at any point and these must be made of a corrosion resistant material.

1.2.16.6 Jacking Arrangement

At least two diagonally opposed jacking screws shall be provided for belt tensioning in the case of belt-driven units. Direct-coupled motors above 10 kW shall be provided with jacking screws for horizontal alignment and direct-coupled motors above 150 kW shall be provided with jacking screws for vertical alignment as well. Jacking screws shall be of grade 316 SS, or better.

Drilled and tapped flat plate is not acceptable for jacking points. A jacking point shall consist of a suitable hot-rolled steel section welded to the baseplate and with a captured machine nut to accept the jacking screw.

1.2.16.7 Grouting

Baseplates shall be designed and grouted to eliminate collection points for water or dirt. Except where otherwise approved in writing by the Engineer, all baseplates on concrete plinths shall be fully grouted in. Grouting holes must be provided on baseplates having a continuous top plate. Tapped holes and fixing setscrew protrusions shall be suitably protected.

The material used for grouting shall be a non-shrink, cementitious grout (ABE Duragrout 1000, or equivalent). ABE Epidermix 324, or equivalent, is acceptable if the Contractor’s design requires an epoxy grout to be used.

The initial grouting shall be overseen by the grout supplier's technical representative.

1.2.16.8 Fasteners

Anchor fasteners shall be of grade 316 SS, or better.

small amount of a nickel-based, anti-seize compound shall be applied along the full length of fastener threads before the nut is applied.

1.2.16.9 Alignment

Preliminary alignment of equipment mounted on baseplates shall be done at the factory to ensure that the baseplate has been correctly manufactured, but final alignment shall always be done on Site after installation and grouting has been completed. Alignment shall be accurate and to the approval of the Engineer and a final alignment check witnessed by the Engineer must be carried out by the Contractor prior to start up.

1.2.17 Guards

Guards shall comply in all respects with the Occupational Health and Safety Act of 1993 as amended and the following points shall also be noted:

i) Guards are required to cover all moving or revolving components of machinery. Guards which do not adequately cover moving protrusions such as keys, lock-nuts, lockwashers, setscrews, etc., or irregularities such as keyways, will under no circumstances be accepted.

ii) Guards shall be neatly and rigidly constructed and fixed and shall not vibrate or cause noise during operation.

iii) Where expanded metal or similar mesh is used, the mesh opening shall not permit a circular object 10 mm or larger to penetrate.

iv) Mesh shall not be used for chain guards but on belt drives the side of the guard most conveniently sited for inspection shall be constructed of expanded metal or similar. Mesh should similarly be used in other situations where inspection or ventilation is required.

v) Guards shall completely enclose drives and shall entirely prevent a person from touching any moving protrusion.

vi) Allowance must be made for adjustment on belt guards or where adjustment will be required.

vii) It shall be possible to remove the guard easily for maintenance purposes.

viii) Guards shall preferably be fabricated of 316 stainless steel (uncoated) but may also be hot-dip galvanized, hot-metal zinc-sprayed or hot-metal aluminium-sprayed carbon steel, coated to Specification in all these cases. Fasteners shall be M10 or larger and shall be of 316 stainless steel.

1.2.18 Power Transmission

1.2.18.1 Shaft Couplings

Shaft couplings shall be selected to reduce transmission of misalignment forces and of torsional oscillations between the driving and driven machine. Couplings shall, wherever practical, be of the rubber-tyre or rubber compression type, keyed to the shafts.

Elastomeric elements shall be urethane based. Flexible metallic elements shall be of stainless steel. Couplings shall not require lubrication.

Spacer couplings shall be used in all cases where this will assist maintenance.

Coupling guards shall comply with the requirements of the OHS Act and shall be to the approval of the Engineer.

After installation, the alignment of all couplings shall be checked by the Contractor in the presence of the Engineer or a person delegated by him. Alignment shall be accurate and to the approval of the Engineer.

1.2.18.2 Vee Belt Drives

Vee drives shall be designed to suit the power rating of the motor using service factors appropriate to the driving and driven machinery. Drives shall be designed, manufactured and installed in accordance with BS 3790 and ISO 4184, utilizing taperlock pulleys with taperlocks keyed to the shaft.

Where alternative pulley diameters can be selected, preference must be given to the larger pulley diameters to minimize the belt loading on bearings.

Tenderers shall ensure that the bearing arrangements of driving and driven machinery are designed to cope with the loads imposed by vee-belt drives and shall incorporate lay shafts where necessary. Lay shafts shall be supported by bearings mounted in bearing housings which are adequately sealed and fitted with grease nipples. Bearing units incorporating open, shielded bearings are not acceptable. Tenderers shall submit their design calculations and drawings for lay shaft arrangements for acceptance by the Engineer. Bearings shall be designed for an L10 life exceeding 100 000 hours.

1.2.18.3 Motor Driven Gearboxes

Gearboxes shall, unless otherwise specified, be supplied with environmental protection to IP 55.

Gearboxes shall be selected using a service factor of 1,75 based on the drive rating and shall have an efficiency of not less than 96 % on two stage reduction and 95 % on three stage reduction.

Gears shall be case hardened, profile ground and lapped, helical and spiral bevel gears.

Roller bearings shall be used throughout. Bearings shall be designed for an L10 life in excess of 100 000 hours.

The gearbox housing shall be of rigid cast iron construction preferably split in the horizontal plane.

A breather designed to prevent moisture from entering shall be fitted.

Oil-bath gearboxes shall have suitable oil level indicators or dipsticks. Unless otherwise decided by the Engineer, the drain from the gearbox shall be extended beyond the base so that the oil can be easily collected. The drain line shall be of grade 316 stainless steel and shall be fitted with a ball valve and square-head plug. Each gearbox shall be mounted on machined sole plates fitted with jacking screws to assist with alignment.

1.2.19 Condition Monitoring

1.2.19.1 General

Condition Monitoring comprises actions of collecting regular information about machinery
condition to detect failures or deterioration of machinery. Measurements and observations shall be carried out during operation of the equipment at various sites within Employer's jurisdiction. A full technical report with corrective measures should be issued upon completion of the work and feedback should be given to the responsible person / people involved.

The purpose of machine condition monitoring is to monitor the state of a machine and detect any deterioration in condition, to determine the cause of this deterioration and predict when failure can be expected. The result is to maximize the availability and utilization of equipment.

1.2.19.2 Scope

This specification provides for the supply of computerised condition monitoring services within Employer's sites. The service shall be provided by suitably qualified and experienced individuals and shall include labour, material and travel costs.

Data shall be collected by the Contractor onsite with hand held tools and equipment. The captured data shall then be downloaded into a database for trending and analysis.

It will remain the responsibility of the Contractor to co-ordinate his site visits with the relevant personnel prior to visiting the site. On arrival the Contractor must liaise with the relevant personnel and obtain the necessary approvals and permits before proceeding to monitor any equipment.

The Contractor must submit a full report on all data collected. Colour coding shall allow for easy differentiation of trends and data points outside normal accepted parameters.

1.2.19.3 Vibration Analysis

The mechanical vibration of newly installed machines measured at strategic predetermined points shall be lower than that specified as "good" for that class of machine in ISO 10816 and ISO 2372. The table below shows the classification of vibration severity zones along with the relevant colours.

Table below: Classification of vibration severity zones

<table>
<tr><td colspan="6">VIBRATION SEVERITY (ISO 2372)</td></tr>
<tr><td colspan="2">Macine</td><td>Class I
(<15kW)</td><td>Class II
(15-75kW)</td><td>Class III
(>75kW)</td><td>Class IV
(>75kW)</td></tr>
<tr><td rowspan="5">Vibration
Velocity
V_{RMS}</td><td>mm/s</td><td colspan="4"></td></tr>
<tr><td>0.28</td><td rowspan="2">A</td><td rowspan="3">A</td><td rowspan="4">A</td><td rowspan="4">A
(Good)</td></tr>
<tr><td>0.45</td></tr>
<tr><td>0.71</td><td rowspan="2">B</td></tr>
<tr><td>1.12</td><td>B</td></tr>
</table>

	1.8	C		B	
	2.8		C		B (Allowable)
	4.5	D		C	
	7.1				C (Tolerable)
	11.2		D	D	
	18				D (Not permissible)
	28				
	45				

These evaluation zones are defined to permit a qualitative assessment of the vibration of the given machine and provide guidelines on possible actions.

Classifications:

Class I: Small (up to 15kW) machines and subassemblies of larger machines.

Class II: Medium size (15kW to 75kW) machines without special foundations or machines up to 300kW rigidly mounted on special foundations.

Class III: Large rotating machines rigidly mounted on foundations which are stiff in the direction of vibration measurement.

Class IV: Large rotating machines mounted on foundations which are flexible in the direction of vibration measurement.

Plant to be monitored:

Analysis may be performed on each individual rotating machine component rated larger and equal to 15kW within an operating speed of 120 rpm and 3000 rpm. Machines to be monitored may include:

ix) Blowers and Fans

x) Electric Motors

xi) Gearboxes

xii) Generators

xiii) Pumps

xiv) Turbines

For each point on the motors, gearbox and blower shaft bearings the Fast Fourier Transform (FFT) frequency range must be set correctly to monitor frequencies of interest i.e. bearings and gears. Vibration readings must be recorded on all machine-bearing points in the Radial, Vertical and Axial planes where permissible.

Experience and Qualifications:

Inspection personnel engaged in the execution of this contract shall be adequately qualified and trained. Minimum training requirements for individuals shall be in accordance with ISO 18436-2:2014 Vibration and Condition Monitoring – Category 2 (or equivalent). The Contractor shall submit copies of CV's and training certificates upon request.

Contractors shall state their experience with this type of work by completing the appropriate schedules.

Detailed Vibration Analysis Reports:

Refer to 0

1.2.19.4 Thermography

The Infra-Red camera shall be designed for Preventative Maintenance (PM) use by indicating areas with excessive heat build-up for mechanical and electrical equipment. This shall include electrical switchgear, transformers, motors, pumps, etc. The camera shall be capable of viewing the heat dissipated by equipment in order that preventative maintenance may be undertaken prior to damage of the particular equipment.

Minimum IR Camera Requirements:

xv) Full analysis and reporting software

xvi) Calibration Certificates

xvii) Minimum IR resolution 160 x 120

xviii) Minimum NETD thermal sensitivity 0.1̊C at 30̊C

xix) Minimum temperature measurement range -20̊C to 150̊C

xx) Temperature measurement accuracy ±2% at 25oC

xxi) Visible camera resolution 2 megapixels

xxii) File formats JPEG, BMP

Detailed Thermography Reports:

Refer to 0

1.2.19.5 Oil Analysis

Category	Key Analysis
Machine Wear	Fine wear metal
	Large wear metal elements
Contamination	Sand and grit
	Dilution
	Water/Moisture
	Alien fluid
	Carbon
Degradation	Oxidation, Nitration, Sulfation
	Viscosity
	Acid number (AN)
	Base Number (BN)
	Additive package

Oil Sampling Best Practices:

Referring to Original Equipment Manufacturer (OEM), workload of machinery as well as Project Plan where applicable, both vibration testing and oil sampling should be conducted on the same day to minimise site visits and machine lockout.

Pertinent questions to consider when arriving at a sampling interval include:

xxiii) Hazard Identification and Risk Assessment

xxiv) Criticality of equipment (or lack of redundancy)

xxv) Environment (is it wet, dry?)

xxvi) Operating conditions (load, speed)

xxvii) What is the failure history?

xxviii) How costly is a failure? In repair cost?

xxix) Have operating conditions changed to put more stress on the machine?

In general, a quarterly or monthly sample interval is appropriate for most important industrial machinery, but will be determined by the Project Plan for each individual facility

A representative oil sample should be taken at the same location using the same method each time, as the following table indicates:

Equipment	Sampling Point
Engine Crankcases	- Through dipstick holder
	- Sample valve on crankcase sump wall
	- Return line before filter
Hydraulic Systems	- Sampling Valve on return line before filter
	- Reservoir - mid-point, away from reservoir walls
Compressors	- Crankcase: about midpoint away from crankcase walls
	- Return line after oil separator
Gearboxes	- Sump: mid-point. Avoid sump floor sludge and side wall deposits
Turbine Systems	- Reservoir – mid-point, keep away from sidewalls and baffle plates
	- Main bearing return line
	- Secondary points-after bypass filtration system

Sampling shall take place under the following conditions:

xxx) While the machine is operating

xxxi) Samples shall always be taken from the same point

xxxii) Individual clean specimen bottles to be supplied for each sample

xxxiii) Samples taken shall be immediately labelled in detail to prevent mix up

xxxiv) Sample accessories (tubes, pipes etc) to be clean & free from contamination o Drain off dead leg oil/water/debris before sampling

xxxv) Vacuum extraction of oil samples to used where permissible

xxxvi) Samples to be taken from “free flow oil” when permissible to avoid latent contamination

Oil sampling shall not be done immediately after an oil change or makeup.

Facility Accreditation:

Equipment for oil sampling and facilities for testing must be accredited by SANAS according to ISO 17025.

Appropriate Standards:

Appropriate safety standards need to be adhered to such that the Employer’s obligations in terms of the OH&S Act NO. 85 OF 1993 and associated regulations are adequately catered for.

The Service Provider shall provide a health and safety plan which could include written safe work procedure. Material safety data sheets (MSDS) to be provided for all chemicals, oils detergents, solvents and cleaning agents.

ISO 4406:1999 Fluid Cleanliness Standard

Contamination classes guideline as per ISO Classification Table:

Turbines ISO Class 14/11, Compressors ISO Class 14/11, Hydraulic Systems ISO Class 15/12, Gearboxes ISO Class 16/13, Engines/Pumps ISO Class 15/12.

Detailed Oil Analysis Reports:

Refer to 0

1.2.19.6 Detailed Reports

All detailed reports shall include:

xxxvii) Photograph of the monitored equipment nametag

xxxviii) Existing fault levels

xxxix) Existing alarm levels

xl) Findings and recommendations

xli) Data capturing and analyses equipment calibration certificates

Vibration Analysis Reports

xlii) Photographs of the monitored equipment depicting drive end (DE) and non-drive end (NDE)

xliii) Vibration amplitude (mm/sec) – assessed against zones as described in the table D37.3

xliv) Frequency (Hz) – refer to ISO 2954

xlv) Plot trends and dynamic data points – Trend, spectrum and wave form

xlvi) Trend display and overall vibration levels

Thermography Reports

- IR versus visible image side by side

Reporting Oil Analysis Reports

- A detailed analysis report is required with every sample taken

All material which the successful Contractor is required to prepare or develop in the performance and completion of this contract, including exception reports, trend plots, dynamic data plots, notes and reports shall become the sole and exclusive property of the Employer without limitation when made or prepared, whether delivered or not. The Contractor shall however retain the right to use the same to perform the work under this contract.

It will remain the responsibility of the Contractor to ensure that all data is backed up onto a reliable storage medium.

1.2.19.7 Condition of Measurement Roots and Points

Before any data may be collected or processed the plant to be monitored must be configured in software to define the points to be monitored. All available machine data, parameters, alarm levels, and known fault frequencies must be noted.

The Contractor shall at all times utilize the most cost efficient and technically reliable technology to accurately diagnose and report on the machine health, identifying any possible defects.

The Contractor shall comment on visual inspections (oil leaks, cleanliness, loose items, blocked vent, open wires, safety issues etc) and general machine as well as factory condition.

1.2.20 Noise Control

1.2.20.1 General

Noise emitted by equipment shall be kept to a minimum and shall not exceed the noise levels specified in these documents.

1.2.20.2 Noise Levels

The sound power of any equipment shall not exceed 89 dB(A) (referred to 10-12 Watts) unless specifically approved by the Engineer. This is approximately equivalent to a sound pressure level of 81 dB(A) at a radius of one metre from the acoustical centre assuming uniform hemispherical propagation in a free field on a hard floor. In certain instances, a lower noise level may be called for in the Detailed Mechanical Specification.

Where the Contractor is unable to restrict the noise level of the machines to the maximum specified by the appropriate selection of suitable equipment; e.g. by selecting slow speed or silent type machines, quiet type cooling fans, suitable silencers, etc.; this shall be clearly pointed out by the tenderer so that appropriate steps can be taken at the design stage to counteract the effects of noise.

1.2.20.3 Acoustic Treatment

Acoustic enclosures are not acceptable unless specifically called for. Acoustic treatment of high noise sources must, however, be included where applicable where this can be done without greatly interfering with operation or maintenance.

When acoustic lagging is called for in the Detailed Mechanical Specification this shall consist of a 100 mm thick layer of rockwool having a density of 60 kg/m3, suitably fixed in place and reinforced to prevent collapse, and covered with 25 mm thick asbestos free plaster having a density of 1 000 kg/m3 (I.P. Insultex AF720, or equivalent). The outer surface shall be finished off with scrim cloth before being painted.

It is not necessary to lag flow meters and cast iron valves on acoustically lagged pipelines.

Components which can move, such as those associated with expansion bellows or mechanical couplings, shall be enclosed by an effective acoustic enclosure designed to prevent sound transmission but able to cope with movement without damage.

1.2.20.4 Measurement

Noise levels will be verified by taking impulse weighted Leq readings in dBA over ten minutes at the specified positions. Readings so achieved shall not exceed the specified level by more than 2 dBA. Should the noise exceed the specified level or should the level be in dispute, the Contractor will be responsible for obtaining certified sound pressure levels across the full octave band mid-frequency range in order to establish the precise A-weighted level.

1.2.21 Thermal Lagging

Thermal insulation shall only be carried out after successful pressure testing of the equipment.

The efficiency of the insulation system shall exceed 90 % and the insulation cold face temperature shall not exceed 40 ºC.

Pipe insulation shall consist of pre-formed insulation material having a thermal conductivity of approximately 0,040 W/mK at 60 ºC. The insulation material shall not have any corrosive effect on the pipework and, in particular, it must be noted that fibreglass may not be used on stainless steel.

Inside buildings, or in other protected areas, pipe insulation shall be supplied with a canvas covering having a 50 mm lap at one end and along the longitudinal seam. The laps shall be sealed using a suitable lagging adhesive. On bends the insulation material shall be neatly mitred and covered with canvas. At all flanges the insulation shall be closed off. Flanges, couplings, tees and valves shall be insulated using a removable canvas blanket or jacket fastened in place with brass hooks and eyes.

All insulation shall be coated with a suitable sealer and then painted in accordance with the colour code. The manufacturer shall advice regarding the paint types and system to be used.

Outside buildings or in other exposed areas pipe insulation shall be fixed in position using three bands per section or a suitable adhesive and then clad with aluminium. All longitudinal and circumferential joints shall incorporate a 50 mm lap with each edge grooved. The longitudinal joints shall be positioned in the "twenty past" position with the lap and groove downwards. All ends next to couplings or flanges shall be closed off and sealed before fitting muff type insulation and cladding over the couplings and flanges. All bends, tees and other fittings shall also be insulated and clad but valves need not be insulated. All joints shall be primed and sealed using a silicone or other appropriate sealer and the contractor shall generally ensure that the lagging is weatherproof with particular attention being paid to all joints and pipework support or anchor points.

With large exposed items such as vessels mounted outside, the Tenderer shall recommend a suitable system incorporating a 20 mm thick, smooth layer of weatherproof, reinforced plaster covered with a scrim cloth and overcoated with at least two coats of fibre reinforced resin sealer.

1.2.22 Bearings

1.2.22.1 General

Bearing systems shall be designed to provide safe start-up and shut-down, under normal stoppages as well as electrical supply failure, without damage.

Unless prevented from running in a particular direction, rotational bearings shall be designed to support shaft rotation in both directions.

1.2.22.2 Bearing Choice

Bearings shall be chosen primarily to suit the equipment manufacturer’s requirements and the plant’s design conditions but the following guidelines shall be considered:

i) Greased lubricated bearings are generally acceptable for units with power ratings up to 100 kW.

ii) Units with power ratings between 100 kW and 1 000 kW shall preferably be provided with rolling element bearings.

iii) Units with power ratings above 1 000 kW and with high speed shafts shall preferably be provided with plain bearings (oil-film type). Plain bearings shall be provided with oil ring lubrication or positively fed lubrication.

1.2.22.3 Design Life for Rolling Element Bearings

Ball and roller bearings shall generally be selected for a design life of 100 000 – 200 000 hours; i.e. the bearing manufacturer's category for machines required to work with a high degree of reliability 24 hours per day.

1.2.22.4 Thermal Alarms

Thermal alarms on bearing systems shall be set in accordance with the specific instructions of the equipment manufacturer or, if it necessary for these to be set on Site, such alarms shall be set after no less than 24 hours of operation have occurred.

1.2.23 Lubrication

1.2.23.1 Grease Lubrication

Where greasing points are not easily accessible, grease lines shall be piped to an easily accessible position for manual greasing. Each grease point shall be provided with completely separate pipework.

A distributor shall be provided where motorised lubrication is provided to more than one destination. The distributor shall be a positive displacement device which ensures equal, successive lubrication to all destinations.

Pipework for grease distribution shall be of stainless steel or non-ferrous metal.

1.2.24 Flow Meters

1.2.24.1 Electromagnetic Flow Meters

Meters

Electromagnetic flow meter sensors shall be full-bore, in-line, double-flanged units with remotely mounted transmitters. The transmitters shall provide local flow indication and 4-20 mA output. Sensors shall, unless otherwise specified, have IP 68 protection and transmitters shall have IP 67 protection.

Electromagnetic flow meters shall have polyurethane lined stainless steel tubes with either Titanium or Hastelloy C electrodes. Accuracy shall be $\pm$ 1 % of flow or better. Rubber linings are acceptable for treated water applications.

Calibration shall be in litres per second unless otherwise specified.

For applications other than for treated water, flow meters shall be provided with an electronically operated electrode cleaning device. Automatic, timed cleaning shall be provided.

Installation

The equipment shall be correctly installed, connected, adjusted and calibrated by competent persons. Calibration shall be done in the presence of the Engineer. The operation and signal transmission of meters against electromagnetic interference shall be provided.

The meter shall be installed with a straight pipe length of at least 5 pipe diameters upstream of the sensor and a straight pipe length of at least 2 pipe diameters downstream of the meter. If this is not possible, specific measures shall be taken to provide flow straightening. The complete meter installation shall comply with the manufacturer's instructions.

Grounding rings shall be supplied and installed if the application requires these.

Testing

A factory test calibration certificate shall be provided for each flow meter.

The flow meter shall be provided with a simulation test unit for field verification of the measuring system without removal of the sensor. If more than one identical model flow meter is installed, two simulation test units shall be provided.

1.2.24.2Visual Flow Meters and Indicators

General

Visual flow meters or flow indicators shall be provided if specified in the Detailed Mechanical Specification. These are normally used for auxiliary circuits such as cooling and lubrication circuits and for flushing of mechanical seals.

Design and Materials

The units shall be of the double window type with a graduated indicating flap. Flow indicators which utilize a moving spinner or ball will be acceptable in some applications.

The body shall be double flanged and shall incorporate easy dismantling to allow cleaning of the windows.

Bodies shall be of stainless steel.

1.2.25 Gauges

1.2.25.1 Gauges – General

Gauges shall comply with the following:

i) Gauges shall be of durable, industrial construction. Case and bezel shall be of stainless steel unless this material is unsuitable.

ii) Scale markings shall be radial, plain, straight, black lines on a white background and shall be spaced so that one scale division represents approximately 1 % - 1,5 % of the maximum scale value in values of 1, 2 or 5 multiplied by any power of 10 to suit the maximum operating rating.

iii) On circular gauges the scale shall be concentric and the maximum and minimum scale values shall be near the bottom of the gauge, with the scale symmetrically disposed about the vertical centre line of the gauge.

iv) The tip of the pointer shall be of the knife edge type extending across the scale divisions and shall be as close as practical to the dial.

v) Wherever applicable, gauges shall be clearly strip marked in green to indicate the normal operating range and in red to indicate the non-permissible range of values. Such markings shall always be on the inner scale face and not on the glass face.

vi) The units of measurement shall be clearly marked on the dial. A printed label of approved non-corrosive material indicating the duty of the gauge shall be neatly fixed on or near the gauge.

1.2.25.2 Gauge Installation and Mounting

Gauges shall be installed and mounted in accordance with the following:

i) Gauges shall be mounted vertically and in such a position that they can be easily read from floor level.

ii) Flanged nozzles for gauge tappings shall be provided on the parent pipework. Nozzles shall comply with the requirements of the Clause "Pipework".

iii) Gauges for permanent equipment installations, such as for centrifugal and reciprocating pumps, shall not be mounted directly on pipework but shall be mounted on a wall or on a pedestal stand so as to minimise vibration. Gauge cocks shall be provided at each end of the connecting pipework.

iv) Pressure gauges shall be fitted with an isolating and air bleed cock.

v) Pressure gauges used on sewage, sludge, powder, chemical or other applications where blockage or corrosion of the gauge is possible shall be fitted with a diaphragm type chemical seal, both being liquid filled. The portion of the seal in contact with the process liquid shall be of a suitable non-corroding material and, when solids are handled, shall have a large threaded socket connection not smaller than 1" BSP.

vi) Gauges for liquids containing solids shall have the nozzle on the side of the parent pipe and the configuration shall allow easy cleaning of the passageways.

1.2.25.3 Pressure Gauges

Pressure gauges shall comply with the following:

i) Pressure, vacuum or compound gauges shall comply with SANS 1062. Gauges shall be of Accuracy class 1.6 and Durability grade A unless otherwise specified. The gauges shall bear the Standards South Africa mark.

ii) Gauges shall have a scale diameter of not less than 100 mm.

iii) Calibration shall be in kiloPascals with the full scale reading between 1,5 and 2 times maximum actual operating pressure except where otherwise specified. The full scale reading for a gauge on the discharge leg of a centrifugal pump shall be higher than the pump shut-off head.

iv) All gauges shall be suitable for continuous operation and shall be liquid filled on all pump applications and where fluctuations in pressure may cause damage.

v) Gauges shall not be mounted directly on equipment subject to vibration. Gauges in pump stations shall not be mounted directly on the pipework and shall be connected to the pressure tapping point by small diameter stainless steel pipework.

vi) For dry locations indoors, the casing may be reinforced plastic or epoxy coated aluminium and the elastic element and shank of stainless steel. For damp indoor locations, particularly in any location where sewage is flowing, and for all locations outdoors, the gauges shall be weatherproof and have the cases and other metal components of grade 316 stainless steel.

vii) When used on steam lines a siphon shall be fitted between the steam line and the gauge which shall be filled with water before putting the gauge into service

1.2.25.4 Temperature Gauges

Temperature gauges shall comply with the following:

i) Temperature gauges shall have dials not less than 120 mm diameter. Accuracy shall be + 1 % of reading or better.

ii) The gauges shall be fitted vertically into removable 316 stainless steel wells and the gauges shall be removable without leakage from the pipe or vessel. Protrusion into a pipeline shall be kept to a minimum. When handling sludge, sewage or other abrasive liquids the protrusion shall not exceed 15 mm and in this case the wells shall also be of a heavy duty abrasion resistant type.

1.2.25.5 Thermometers

Thermometers shall be of the liquid column type and the complete tube shall be protected by a sturdy pocket of stainless steel or brass.

1.2.26 Pump Performance Testing

1.2.26.1 Performance Test

The pump units including the pump coupled to the motor, shall be tested at the manufacture's works in the presence of the engineer or his representative. The cost of carrying the work performance tests shall be deemed to be included in the overall cost of the plant. Tolerance limits and acceptable regulations shall be ISO 9906: Grade 1. The test results should be supplied to the Employer Branches within two weeks.

Works tests includes:

i) Balancing of the complete impeller and shaft at the manufacturers place

ii) Flow head curves shall be generated at the manufactures premises and checked against the manufacture's listed pump curves for any major discrepancies

1.2.26.2 Testing On Site

The testing of the pumping plant shall be carried out strictly in accordance with ISO 9906 Grade 3 or according to the conditions of contracts where specified in the Detailed Mechanical Specification. During the testing of each unit careful examination will be important and the records are to be kept. The examination records should incorporate the following:

iii) Differential pressure rise across the pump

iv) Pressure (suction and discharge)

v) Flow (instantaneous and totalized)

vi) Electrical power consumption

vii) Efficiency

viii) Bearing temperatures and vibration analysis

The pumping unit shall be calculated to determine whether these are in compliance with the guaranteed figures submitted by the contractor at the time of tendering.

After commissioning, checks should be carried out for proper functioning, direction and speed of rotation, and power consumption over the Trial Operation Period. Equipment performance will be considered acceptable when the requirements as specified have been met consistently during test period. The performance of the equipment shall be examined and tested at 1, 3, 6, 9 and 12 months intervals during Defects Notification Period. At each test intervals performance reports including items of examination should be submitted to the engineer.

1.2.27 Spares

Spares which are specified in the Detailed Mechanical Specification shall be packed individually in wooden boxes with the lids unattached. Each box shall be labelled with the Contract number, manufacturer, contents, relevant part/model numbers and the supplier's address. The boxes shall be brought to Site and the lids shall be secured to the boxes immediately after the Engineer has approved the spares and the packaging.

1.2.28 Control Systems

1.2.28.1 General

Control systems shall comply with the following:

i) Control shall function as an integrated, coherent system.

ii) Protection systems shall be designed to prevent damage to equipment. Failing to start, tripping or stopping of any item of equipment shall prevent the start-up or shall initiate the appropriate shut-down procedure of related equipment in cases where damage could occur.

iii) Emergency stop stations shall be provided near to each motor driven unit.

iv) Digital indicators shall provide no fewer than three significant places (and, preferably, no more than three).

1.2.28.2 Design

The design of the control system, including drawings, functional specification, control panel layout, circuit diagrams and protection systems, shall be submitted to the Engineer for acceptance.

1.2.28.3Testing and Commissioning of Control Systems

Setpoints for equipment and process parameters which are required for the operation of control systems shall be obtained once the equipment is operational.

The Contractor shall submit a schedule of all control functions to be checked on Site during testing and commissioning. This shall be submitted for acceptance by the Engineer. The format shall be as follows, or similar:

COMMISSIONING - CONTROL SYSTEM TESTS				
Date	Test Function	Test Method	Result (e.g. SCADA message, etc)	Proposed Corrective action

1.2.28.4 Technical Details

Control Panels

Where the details of motor starter panels have not been specified in the electrical specifications, every 400 V starter panel shall include the following standard equipment:

i) Circuit breaker (complete with auxiliary contacts for control circuits).

ii) Contactor.

iii) Overload relay with manual reset

iv) Ammeter (CT based, if above 40A).

v) Starter alive indicating light (Red).

vi) Motor running indicating light (Green).

vii) Running hour meter.

viii) Selector switch.

ix) Stop push button.

x) Start push button.

PLC/SCADA Systems

Control systems utilising PLC/SCADA systems shall incorporate the following:

i) The PLC/SCADA system shall be configured for equipment to be PLC controlled such that the installation will be able to operate following a failure of the SCADA system.

ii) Mimic screens provided for SCADA systems shall include the following (unless inapplicable):

iii) Overview of scheme; including the process flow diagram and indicating all electronically monitored parameters which are not included in a sub-system.

iv) Overview of each plant grouping.

v) Individual unit (Centrifuge, compressor, pumpset, etc.).

vi) Equipment sequence selection.

vii) Equipment start interlocks.

viii) For each motor larger than 55 kW, motor status and, where applicable, motor protection relay diagnostic.

ix) Electrical reticulation schematic.

x) Hardware diagnostic.

xi) Alarms.

xii) Set-points for alarm, trip and control loop functions (including password protected alteration facility).

xiii) Record of equipment and process parameters at instant of equipment trip and station trip (see also below).

xiv) Event log.

xv) Trending of monitored system parameters (see also below).

xvi) Communication status of control system hardware.

xvii) SCADA security system current settings, including personnel names.

xviii) Ancillary equipment status; e.g. security, fire detection, UPS.

xix) Printing.

xx) Trend screens shall be as follows:

xxi) Screens may include logical operational groupings.

xxii) Points of inflection of measured parameters shall be recorded.

xxiii) Trend screens shall be provided for 3 hours, for 7 days and for 3 months (unless the nature of the parameter demands different scales).

xxiv) At least one colour printer (for graphs, mimics, etc.) and one line printer (for alarms) shall be provided in accordance with the detailed specifications.

xxv) The control system shall provide an alarm on the SCADA screen if an instruction to an item of equipment to start or stop does not cause that item to start or stop.

xxvi) Alarm conditions which lead to the control system executing an equipment trip shall be logged. Subsequent alarms which occur as a result of the tripping action shall be logged as subordinate alarms. The condition **which caused the trip** shall be described with respect to the:

xxvii) Item of equipment.

xxviii) Trip setpoint reached.

xxix) Description of parameter; i.e. flow, temperature, etc.

xxx) Time of event.

xxxi) A time delay following an alarm condition leading to a control system trip shall be incorporated in order to prevent tripping actions caused by electrical disturbances or similar occurrences. The time delay chosen shall match the functional needs and shall be decided in conjunction with the Engineer.

xxxii) Three significant places shall be used for representation of values on SCADA systems.

1.2.29 Contractor's Drawings

The Contractor's drawings shall comply with the following:

i) Drawings shall be provided in electronic data of AutoCAD format or compactable version indicating the true reflection of as built design.

ii) Drawings shall be prepared in accordance with the latest issue of SANS 10111. The equivalent BS code of engineering drawing practice will also be acceptable.

iii) Drawings shall be to A1 or A0 size.

iv) Drawings shall be to scale, with both the scale and the drawing being large enough to clearly show all relevant components of the plant and equipment.

v) In addition to the usual plan and two side elevations, sufficient additional sections shall be included to clearly show the arrangement of all plant and equipment.

vi) Item lists shall be provided on the drawing or on a separate parts list.

vii) Item descriptions shall include the material of construction, quantity and full identification information, including, as applicable, brand name, manufacturer's reference number, model number, size, rating, source, duty, quantity, etc.

1.2.30 Contractor's Responsibility With Regard To Civil Works

Buildings and concrete structures will form part of a separate civil contract which will include all plinths, foundation blocks, rebates, pockets, holes, thrust blocks and so forth to accommodate the installation of the plant as must be detailed on the drawings and other information to be submitted by the Contractor in terms of the Contract.

While the building and civil work will be done by others under a separate contract, the Contractor shall, prior to taking possession of the Site and before delivering any equipment to site, inspect and check the related building and civil works for accuracy and suitability of construction and for conformance with the Contractor's drawings. No payments shall be allowed for additional costs to the Contractor resulting from a failure to check such works timeously.

Ensuring that holes through walls and floors have been done correctly will be the responsibility of the Civil Contractor however the supply and installation of all foundation bolts and grouting of bases, supports or any other mechanical equipment shall be the responsibility of the Mechanical Contractor.

1.2.31 Training

1.2.31.1 General

During the Trial Operation Period, the Employer's site staff will assist the Contractor in operating the plant and the Contractor shall train these staff in the starting, operating and stopping of the plant and shall train the Employer's maintenance staff on the maintenance requirements and procedures. Unless otherwise called for in the Detailed Mechanical Specification, the Tenderer shall price for the on-Site personal tuition of 10 operational staff members and 5 engineering staff members depending on the nature of the project.

The Contractor shall also provide the trainees with printed copies of the Operating and Training Manual which forms part of the Operation and Maintenance Manual.

1.2.31.2 Operational Staff Tuition

The Contractor shall provide the following tuition as applicable to the Contract:

i) Start-up, shut-down and operating instruction for all operational modes for the Works shall be provided. This shall be comprehensive and shall include actions to be taken in the case of all alarm conditions and basic fault finding.

ii) A layout drawing of the installation, a process flow diagram, and a P&ID shall be provided for each Operator. The instructions described in (a) above shall also be provided in printed form for each Operator.

iii) If the specified control system is SCADA based, the tuition shall include instruction on the SCADA system.

1.2.31.3 Electrical Engineering Staff Tuition

The Contractor shall provide the following tuition as applicable to the Contract:

i) Control system software instruction.

ii) Detailed overview of 11 kV protection and settings.

iii) Tuition on setting of 11 kV protection.

iv) Motor protection relay and settings.

v) Overview of PLC programming for the purposes of making changes and re-loading programs if PLCs are replaced.

vi) Overview of SCADA system.

1.2.32 Spares

Spares which are specified in the Detailed Mechanical Specification shall be packed individually in wooden boxes with the lids unattached. Each box shall be labelled with the Contract number, manufacturer, contents, relevant part/model numbers and the supplier's address. The boxes shall be brought to Site and the lids shall be secured to the boxes immediately after the Engineer has approved the spares and the packaging.

1.2.33 Operating Instructions And Signage

Operating instructions and signage, if specified in the Detailed Mechanical Specification, shall comply with the requirements below.

1.2.33.1 Operating Instructions

Wall mounted operating instructions shall comply with the following:

i) Start-up, Shut-down and Operating instructions shall be provided. These shall be comprehensive and shall indicate actions to be taken in the case of all alarm conditions. These shall be written from the point of view of the plant operator.

ii) A layout drawing of the equipment installation, a process flow diagram, and a P&ID shall be provided.

iii) Instructions shall be laminated with hardboard backing. All instructions shall be included in Safe Operating Procedure format and form part of the O&M Manuals.

1.2.33.2 Signage

Signs, photo-luminescent, 3mm white Perspex UV resistant, shall be provided by the Contractor in appropriate places on the walls of the plant room and include the following:

i) All statutory and special safety warning instructions.

ii) Course of action during / after electrical shock.

iii) Any operating restrictions for equipment.

iv) Operating instructions in cases of plant trip and electrical supply failure.

Symbolic signs shall comply with SANS 1186.

The wording of the signs shall be approved by the Engineer prior to final printing. All signs shall cross refer, where applicable, to the relevant portion of the Manual.

All signs shall be installed prior to commissioning.

All signs 200mm x 200mm or larger in a wash down area shall be mounted on the wall using chemical mortar and secured with stainless steel ready bar and stainless steel nuts.

Non-wash down areas and signs smaller than 200mm x 200mm shall be secured using PVC fisher plugs with stainless steel coach screws.

For correct selection of mounting fasteners, preventing Bimetallic Reaction/Galvanic Corrosion, refer to: Design and Contracts – Quality Control Procedure 15: Bimetallic Corrosion Prevention.

1.2.34 Operation And Maintenance Manuals

1.2.34.1 Submission of Manual

Three draft copies of the Manual shall be submitted to the Engineer prior to commissioning the Works. One copy will be returned to the Contractor with comments. The second copy will be used by the operational staff on Site.

Four copies of the final version of the Manual, as accepted by the Engineer, shall be provided prior to the start of the Defects Notification Period.

1.2.34.2 General Requirements

The Manual shall comply with the following:

i) The Manual shall be for the complete Works and shall be of a standard acceptable to the Engineer. It shall be in English and shall be practically and neatly presented.

ii) One Manual shall contain original documents and this set shall be marked "Original". The other 3 Manuals shall contain all the information in the original and shall be marked "Copy 2" to "Copy 4".

iii) Binders shall have hard, plastic protected covers utilising four-ring, spring-clip holders. Binders shall not be overloaded. One spare, empty binder shall be provided for every three used. A title label shall be affixed to the spine of all binders. This shall indicate Contract number, title, Contractor's name, Site/Plant name, volume number and contents.

iv) Sections and sub-sections shall be titled, uniquely numbered and provided with separator sheets.

v) Printed matter which is inserted in the Manual shall be arrowed (indelibly) to indicate the equipment installed.

vi) Drawings shall be to a scale which makes details clear. Large drawings shall be held in plastic envelopes in the Manual. A4 and A3 drawings may be bound as normal pages. Drawings shall also be provided on electronic data storage in AutoCAD, or equivalent, format.

vii) Location map, street address as well as GPS co-ordinates to be provided.

viii) Cross-referencing within the Manual is acceptable where duplication occurs.

1.2.34.3 Format and Contents

The Manual shall be in accordance with the following (the Contractor shall modify, elaborate and repeat this format as required):

Electronic Format

All information in the hard copy O&M manuals to be provided in soft copy on a USB flash discs (x6) with separate folders for each section including all material related to the particular section. Each section shall be saved as a separate PDF file, with a hyperlinked index sheet for sub-sections. This shall include drawings and maintenance schedules as separate files. In addition, the "Summary equipment and maintenance template" shall be saved in Excel format under Section 1. Contractor to ensure the latest Excel template is requested, used and completed.

All necessary software programs and passwords to be provided.

No.	Heading	Content
1	GENERAL	
1.1	Contents List	Contents List for complete Manual.
1.2	Description of the Works	The description of the Works shall include a description of; firstly, the process; secondly, the design parameters and; thirdly, a detailed description of the equipment installation supported by drawings and process flow diagrams.
1.3	Equipment List	Equipment list containing each item of mechanical, electrical, instrumentation and control equipment. The equipment list shall include the make, model, serial number, description, size, range, performance data, motor and drive details, supplier's name, address and phone numbers, all as applicable. The design duty, the position of each unit's installation and its purpose in the system shall be given. Additional information which shall be provided for instruments includes the normal operating reading, maximum or minimum permissible readings, set-points (activation, warning and trip), etc. A separate list of all spares provided in terms of this Contract shall also be provided.
1.4	Drawing List	Drawing list of all the Contractor's drawings and the Tender drawings.
1.5	Cable Schedule	Cable schedule for power, data, control and instrumentation cables. This shall include the cable construction, conductor material, insulation, protection, voltage rating, start and finish points, route length, duty, load, voltage drop, core area, no. of cores, no. of cores used and gland size. For cable voltages above 400 Volts, the schedule shall also include the purchase details, specification and date of manufacture.
1.6	Documents	As-built system, layout and GA drawings. Plant circuit, flow diagrams and/or P&IDs. Control panel layouts. I/O list, program listing, loop and logic diagrams

No.	Heading	Content
		for each PLC. Colour prints of SCADA mimic screens, control faceplates and sequences. System control diagram and logic sequence chart. Copy of certificate of electrical compliance.
2	Operation	
2.1	Control System	Description of control system; including all manual and automatic controls. This shall include controls, instruments, protection list, settings, indications, alarms, trips, etc.
2.2	Commissioning	Commissioning Instructions. Commissioning report.
2.3	Operating and Training Manual	Operating and training manual. This shall include normal start-up, adjustment, operating and shut-down procedures and any emergency operating procedures. All specific safety aspects as well as settings, adjustments, observation, etc. shall be provided.
3	Maintenance Schedules	
	Maintenance and Lubrication	Schedule of routine maintenance, by time period, for all mechanical, electrical, instrumentation and control equipment. This shall be all-inclusive but reference to manufacturer's standard manuals in other parts of the Manual is acceptable. The schedule shall incorporate a lubrication schedule of recommended lubricants, capacity, lubrication periods, etc.
4	MECHANICAL EQUIPMENT (This section shall be repeated for each item of equipment)	
4.1	Identifying Information	Identifying information for the item; copied from the Equipment List.
4.2	Nameplate	A photograph of the nameplate and a table containing the unit's nameplate information.
4.3	Design and Operation	Details of operating principles, construction and operating instructions.
4.4	Maintenance Information	Technical and maintenance information including instructions for installation, assembly, disassembly, lubrication, adjustment, calibration, reconditioning, repair, etc.
4.5	Spares	A spares list giving the item number, part number, description, quantity and materials. A list of spares recommended to be held on Site.
4.6	Test Results	Factory and Site test results.
4.7	Corrosion Protection	Corrosion protection systems used, coating supplier's data sheets and coating repair procedures.
4.8	Documents	Performance curves. Large scale, dimensioned, cross sectional and arrangement drawings of the item for assembly and spares recognition purposes, cross-referenced to the spares list. Dimensioned drawings of fabricated equipment. Circuit layout of any auxiliary systems
5	ELECTRICAL EQUIPMENT (This section shall be repeated for each item of equipment)	
5.1 to 5.6	Same as for 4.1 to 4.6 for Mechanical Equipment (see above).	
5.7	Control Details	Control and electrical details, including logic sequence, circuit diagrams and software, as applicable.
5.8	Documents	Electrical reticulation drawings. Equipment overall dimensions. Wiring diagrams. Switchboard layout drawings and SLDs. Electrical panel construction drawings.
6	INSTRUMENTATION EQUIPMENT (This section shall be repeated for each item of equipment)	
6.1 to 6.6	Same as for 4.1 to 4.6 for Mechanical Equipment (see above).	
6.7	Documents	Circuit diagrams of instrumentation systems and of individual instruments. Installation arrangement.
7	CONTROL EQUIP.; ETC.	
7.1	Identifying Information	Identifying information for PLCs, transmitters, HMIs, computers, etc.; copied from the Equipment List.

No.	Heading	Content
7.2	I/O List	Cross-referenced listing of all I/Os used.
7.3	SCADA	Colour prints of SCADA mimic screens, control faceplates, sequences and trend screens. Schedule of alarm messages and TAG lists. File structures, lists and naming conventions.
7.4	Program	Flash disk containing all software. An annotated program listing.
7.5	Documents	Schedule of cable terminals. Copy of SCADA hardware diagnostic mimic.
8	DRAWINGS	
	Drawings	All drawings not filed elsewhere shall be filed in this section.

1.2.35 Starting, Site Testing And Commissioning Of Plant

1.2.35.1 General

The Contractor shall advise the Engineer when instructions may be given to the Building Contractor to execute any necessary screeding and finishings around the Works. Tenderers shall allow a reasonable period in their installation programme for this work to be done and no compensation for delay in the commencement of testing and commissioning shall accrue to the Contractor during such period.

1.2.35.2 Preparation

Installation work shall be complete and accepted by the Engineer prior to commissioning.

Before starting up any section of the Works, the Contractor shall make all necessary checks to ensure that the installation has been correctly carried out, that all ducts, pipework, tanks, etc., are clean, that all equipment is correctly aligned, lubricated and connected up, and is in all respects ready to start with safety. The Contractor shall provide initial fill requirements, such as lubricating oil.

1.2.35.3 Starting-Up and Testing

The Contractor shall arrange for the Engineer to be present at initial start-up and also for any electrical and control instrumentation sub-contractors to be present.

The Contractor shall start up and test each section of the Works. These tests shall be carried out to certify that the Works is operating in accordance with the requirements specified and must be witnessed by the Engineer. All necessary modifications and rectifications shall be carried out during this period.
Set points for equipment and process parameters which are required for the operation of control systems shall be confirmed and recorded.

1.2.35.4 SCADA System

During commissioning of a new installation which incorporates SCADA as part of the control system, each control system alarm and interlock shall be tested and the resulting alarm messages shall be modified by the Contractor to be acceptable to the Engineer.

A schedule of alarm messages and their full explanations shall be inserted in the Manual.

1.2.35.5 Commissioning

When all tests have been completed to the satisfaction of the Engineer, the Works shall be commissioned. Unless the Engineer states otherwise, the complete plant, including all control functions and control systems shall be commissioned as a unit and the process performance requirements shall be achieved during normal operation.

Once the Works has been commissioned to the satisfaction of the Engineer, the operational acceptance period shall start and shall consist of a continuous period of operation free from trouble. Unless otherwise stated, this period shall be four weeks. During the operational acceptance period, the Contractor shall carry out all necessary servicing and any adjustments required. The plant staff will assist the Contractor in operating the Works during this period. The Contractor shall train the operational staff in the starting, operating and stopping of the Works, and shall train the maintenance staff on the routine maintenance requirements.

1.2.35.6 Commissioning Report

A comprehensive commissioning test report, including the SCADA system commissioning procedure and schedule of alarm messages, shall be submitted by the Contractor prior to issue of the Certificate of Completion and shall be inserted in the Manual.

1.2.35.7 Inspection

At the end of the Trial Operation Period, an inspection shall be done by the Contractor and the Engineer for the purpose of taking over the Works in terms of Clause 10 of the General Conditions of Contract.

1.2.35.8 Defects Notification Period

Refer to the General Conditions of Contract and the Detailed Mechanical Specification for requirements regarding maintenance during the Defects Notification Period.

DETAILED MECHANICAL SPECIFICATIONS

2.1 PRESSURE MEDIA FILTERS

2.1.1 Scope

This section covers the following new filters and associated equipment and should be read in conjunction with the P&IDs:

Pressure Media Filters

ix) Six (6) new pressure media filters, including filter media, nozzle beds, nozzles, air valves, all water and air connections, media support gravel, and vessel footings.

x) Relocation and refurbishment of 22 existing pressure media filters.

xi) Space allowance in manifolds for four (4) future pressure media filters.

2.1.2 General Description and Technology

Pressure filtration involves the separation of suspended solids from water by pumping water through a porous filter medium. The filters operate in enclosed chambers, typically using a nozzle plate and frame or recessed plate configurations, where pumps maintain pressure to overcome the pressure loss across the filter bed. Filtration proceeds until the headloss across the filter becomes too high or filtrate quality starts declining, at which point the system is stopped for backwashing and cleaning. A control system regulates pressure and flow to ensure consistent operation across all filter units, with the cleanest units handling the highest flow and the most loaded units the lowest.

2.1.3 Equipment Data and Duties

2.1.3.1 Design Criteria

The design criteria for the new filters are listed in the table below:

Characteristic	Design Criteria	Comments
Filter rate with N filters	8.0 m/h	
Filter rate with N – 2 filters	8.6 m/h	
Water backwash Rate 1	• 30 m/h	Water-only using filtrate pressure (no backwash pump)
Number of pressure filters	22 existing 6 new	To be relocated Identical to existing
Internal Diameter	1.2m	
Total Area per filter	1.13m^2	
Design Pressure	500kPa	
Design Code	PD5500 Cat.2 – Latest Edition	
SANS 347	Category SEP	
Filter Vessel Shell (straight) Height	1.0 m	
Media Retainer	Nozzle Plate from SA355 JR/AR	
Nozzle Density	≥22Nozzles/m^2	
Nozzle Type	Suitable for water backwash rate and specified media	
Material of Construction	BS EN10025-2-S355 JR	
Corrosion protection of the Vessel	Glass Flake Coated with a UV inhibitor	
Inlet	Top with the inlet pipe upwards	
Outlet	Bottom Side	
Connections	Access Hatch for inspection	
Flanges	SANS1123 Tbl.1000/3	

2.1.4 Control Philosophy

2.1.4.1 Normal Operation

Water flow is distributed to all pressure filters via a common manifold system that feeds each pressure vessel. Each pressure filter is equipped with an isolation valve at its inlet from the manifold to enable selective operation or isolation.

Water enters each pressure vessel under pressure, flowing through the filter media and then through the nozzle bed, which retains the media while allowing clean, filtered water to exit. The filtered water from each pressure filter passes through an outlet valve before merging back into the common filtered water discharge pipelines.

The operation of the pressure filters should be monitored on a daily basis by monitoring the upstream and downstream pressure of the filters.

2.1.4.2 Backwashing

Individual filters shall be backwashed by closing the inlet valve to the filter and opening the backwash outlet valve of the filter. The hydraulics downstream of the filters shall be designed such that the filtrate pressure is sufficient to backwash the filter at the specified rate. The combined backwash outlets from each line of (7) filters shall discharge freely at an height of 300mm above the pressure filter media. These lines shall be equipped with a flow meter and throttling valve that will allow minor adjustment of the backwash flow rate.

The filtrate pipe shall discharge into an open standpipe at a height of approximately 2000mm higher than the pressure filter media to ensure adequate back pressure for backwashing of the filters. A pressure sustaining valve and flow meter shall be installed on the common filtrate outlet.

An orifice shall be placed at the filtrate outlet of each pressure filter to limit the outflow from that filter to 1.5 times the nominal filtration rate when that filter has been backwashed clean and the upstream pressure to all the filters is 0.8 bar. The Contractor shall submit his calculations of the orifice sizing to the Engineer prior to procurement and manufacturing.

2.1.5 Filter Media

The filter media shall consist of 300 mm of gravel and 700 mm of sand.

Each filter cell shall be cleaned thoroughly before any filter media is placed. Each cell shall be kept clean throughout the placement operation. Layers shall be placed at a maximum depth of 300 mm, after which they will be washed to remove excess fine materials. Allowance shall be made for a minimum of 5 minutes of washing, with water flowing into the backwash launder. After washing, the water shall be drained, and any remaining dirt shall be skimmed off.

After every layer is rinsed, a bubble test must be conducted on the layer. The bubble test must show an even distribution of bubbles across the media. This must be witnessed by the Engineer and it is the Engineer's sole discretion to approve or reject the layer. After the rinsing is complete and the bubble test is passed, the next layer can be installed. After placing the full sand level, the sand shall be backwashed three times and the top 5 mm of very fine material shall be carefully removed and disposed of off-site. The quantity of pebbles to be supplied shall be 10% in excess of that necessary to form the original bed.

The contractor shall make provision for all water and pumping equipment necessary to wash and rinse filter media.

The filter media properties are described in the following two sub-sections.

2.1.5.1 Support Gravel

Layer	Gravel Grading
50 mm (Top Layer)	19.1 mm - 12.7 mm
50 mm	6.4 mm – 3.2 mm
50 mm	3.2 mm – 1.5 mm
50 mm	6.4 mm – 3.2 mm
50 mm	12.7 mm – 6.4 mm
50 mm (Bottom Layer)	19.1 mm - 12.7 mm

2.1.5.2 Sand

Characteristic	Sand
Type	Quartzitic
Bed Depth – L (m)	0.85
Media Density - ρs (kg/m3)	>2500
Fixed loose-bed Porosity - ε0	0.45
Sphericity – Ψ	0.78
Coefficient of uniformity – UC (m)	>1.3
Effective size – EC (mm)	0.74

The sand shall be quartzitic, clean, hard, durable, free from clay and any other organic matter and obtained from an approved source. The sand shall have a hydrochloric acid solubility of less than 5% when tested in accordance with AWWA Standard B100-53.

The Contractor shall be required to provide certificates of compliance with the above with each bag of media provided.

2.1.6 Valves General

All valves shall be as per the Detailed Mechanical Specification: 0 2.3 **VALVES**.

2.1.7 Pipework General

All pipe sizes to be as per P&IDs and comply with Mechanical Specification: 0

2.7 PIPEWORK. If no pipe size is indicated, the following will apply to this section:

xii) Maximum pipe velocity ≤ 2 m/s.

2.1.8 Materials of Construction

All submerged metal :	316 Stainless Steel
All under-water supports, ties, etc. :	316 Stainless Steel
All fasteners (Incl. Anchor Bolts) :	316L Stainless Steel
Filter outlet box cover frame :	Aluminium

Mechanical Specification: 0

2.2 CENTRIFUGAL PUMPING EQUIPMENT

2.2.1 General

2.2.1.1 Pump Duty

Details of pump duties are given in the Detailed Mechanical Specification and the type of pump and materials of construction shall at all times be selected to suit the fluid to be pumped and the performance requirements.

2.2.1.2 Pump Type

Centrifugal pumps shall, wherever possible, be of the single-stage, end-suction, back pull-out type, direct-coupled to the motor using spacer type couplings and complete with common baseplate and guard. Close-coupled pumps may be used on clear water applications for motor sizes up to 2,2 kW.

2.2.1.3 Pump Speed

Preference shall be given to pumps which operate at 1 500 rpm or lower. Pump speed and casing test pressures must be given in the Tender.

2.2.1.4 Performance Parameters

Performance characteristics shall be suitable for parallel operation with pump head increasing continuously to shut off. The pump shall be selected to operate as close as possible to best efficiency at duty point and shall be adequately sized to safely permit an increase in capacity of at least 25 % should the head be lower than estimated.

2.2.1.5 Margin of Power

A non-overloading absorbed power characteristic, preferably with maximum power absorbed at best efficiency, is preferred.

The motor's continuously rated power shall exceed the greater of the following:

i) 10 % above the maximum power demand under any condition of operation for the pump, including open discharge.

ii) 20 % above the pump's maximum power demand over the full range of flow and pressure conditions anticipated in the pump installation.

2.2.1.6 Life

Pumps and motors shall be designed for long life under continuous operation. Bearings shall be designed for an L10 life of not less than 100 000 hours.

2.2.1.7 Impeller

Preference shall be given to pumps whose impeller diameter does not exceed 95 % of the maximum impeller diameter for the volute/diffuser provided. The impeller surface finish shall be up to N7. The peripheral speed of impellers should be designed not exceeding 10.5 m/sec.

2.2.1.8 Lubrication

Unless otherwise specified in the Detailed Mechanical Specification, bearings shall be grease lubricated and adequately sealed against the ingress of moisture or dirt.

2.2.1.9 Vibration

Rotating elements shall be balanced.

The vibration severity of the unit during operation shall not exceed Vrms = 1 mm/s at the pump and motor bearings.

2.2.1.10 Pump Glands

Shaft sealing shall be arranged as follows:

i) **For clear, non-aggressive liquids up to 200 kPa** discharge pressure - shaft sleeve with packed gland or mechanical seal.

ii) For clear non-aggressive liquids at pressures above 200 kPa and for clear corrosive liquids at any pressure - 316 stainless steel shaft sleeve with mechanical seal.

iii) **For liquids with solids in suspension at any pressure** – mechanical seal or packed gland with hardened and/or protected stainless steel shaft sleeve and grease seal. If a mechanical seal is specified, the pump gland shall be arranged to suit a clean water flush. A throttle bushing made of a suitable non-corrosive, self-lubricating material shall restrict the flushing water flow into the pump. Mechanical seals for such applications shall have silicon or tungsten carbide sealing faces.

2.2.1.11 Venting

A vent cock shall be fitted to the highest part of the casing.

2.2.1.12 Connections

Suction and discharge connections shall be flanged for pump connections larger than 40 mm.

Pump connections of 40 mm and smaller may be screwed. Unions shall be incorporated in the pipework close to the suction and discharge connections.

A flexible coupling shall be fitted close to the pump's suction connection.

2.2.1.13 Isolating and Check Valves

Isolating valves shall be provided on the discharge of all pumps. A check valve shall also be fitted between the discharge isolating valve and the pump except where reverse flow through the pump when stationary cannot occur. Any reducing necessary shall be done immediately next to pump connections.

2.2.1.14 Pressure Tapping Points and Gauges

Pressure tapping points shall be provided near the suction and discharge connections of each pump. These points shall be located, where feasible, on a straight length of pipework where readings will be steady and accurate. Pressure (or suction, as applicable) gauges shall be fitted at these tapping points. Gauges shall measure gauge pressure (i.e. not absolute pressure).

2.2.2 Scope

This section covers the new pumps and associated equipment and should be read in conjunction with the P&ID's. The following Pumps are required:

<u>Filter Feed Pumps:</u>

iv) Pumps settled water from a sump to the media filters - centrifugal pumps (one duty & one standby)

2.2.3 General Description

Centrifugal pumps shall generally comply with clause 0.

Pumps shall be supplied with double-flanged spool pieces drilled to SANS 1123 tables on the suction and delivery sides of the pump. The spool pieces shall be fitted with nipples or flanged tee pieces for pressure indicators, air valves and other instrumentation required as per the P&ID's or specification. All bends should, where practicable, have a radius of 3 x pipe diameter. Tees should be swept with and angle between 45° and 90° depending on pump station layout.

The Contractor shall submit the following characteristic curves as part of his Tender Document:

v) H-Q curve

vi) Efficiency curve

vii) NPSH curve

viii) Motor Efficiency curve

ix) Power curve

The pumps shall be of the horizontal, centrifugal, end-suction type. Where possible single-stage pumps shall be preferred, however, multistage pumps will be acceptable for clear liquids and high pressure applications. The pump selection shall be done to achieve maximum efficiency, favouring the lowest lifecycle cost over a 20-year period.

Each pump shall be equipped with suitable no-flow protection, preferably by using proximity switches on the side lever of the non-return discharge valves.

The pump and motor casing shall be of high quality, close-grained cast iron able to withstand a minimum of 3 x maximum pump shutoff head. A suitable, heavy-duty epoxy or polyurethane coating system with a minimum thickness of 250 µm shall be provided on the pump and motor casings.

The design must make provision for a detailed surge analysis, but as a minimum air valves must be provided on the common discharge lines. Non-return valves shall be designed to be soft-closing and non-slamming. Suction and discharge connections shall be flanged. Flexible couplings shall be fitted close to the suction and delivery connection of all pumps. Restrained flanged adapters are preferred over rubber bellows.

Thrust forces shall be restrained either by pipe supports or restraints across couplings. The anchoring design must make provision for a surge pressure of 3 times the maximum working pressure.

Pumps shall be selected with their best efficiency as near the specified duty point as possible and shall achieve a minimum efficiency of 75% at the duty point. Performance characteristics shall be suitable for parallel operation with the pump head increasing continuously to shut off. The pump shall be selected to operate as close as possible to the best efficiency at the duty point and shall be adequately sized to safely permit an increase in capacity of at least 25% should the head be lower than estimated. The impeller diameter fitted to direct coupled pumps shall not exceed 95% of the maximum impeller diameter for the volute/diffuser provided.

A non-overloading absorbed power characteristic, preferably with maximum power absorbed at the best efficiency, is preferred. The motor's continuously rated power shall be 15% above the pump's input shaft power anticipated in the pump installation. Each pump motor shall be fitted with a temperature sensor integrated with the VSD to protect the motor from overheating.

The pumps shall have an automatic mode as described in the control philosophy of each pump set and a manual mode with push buttons to start individual pumps. When in manual mode protection against low suction water levels and temperature shall still apply. All pumps shall be equipped with an E-stop functionality next the pump.

The backwash water water pump station system requirements spans over a wide range of flows and heads (as shown in the equipment data). For all pump systems, a minimum of 25% standby capacity (rounded up to the nearest whole number) shall be provided.

For pump systems that require 1 to 5 duty pumps 1 standby pump shall be provided and for systems that require more than 5 duty pumps 2 standby pumps shall be provided.

2.2.4 Equipment Data and Control Philosophies

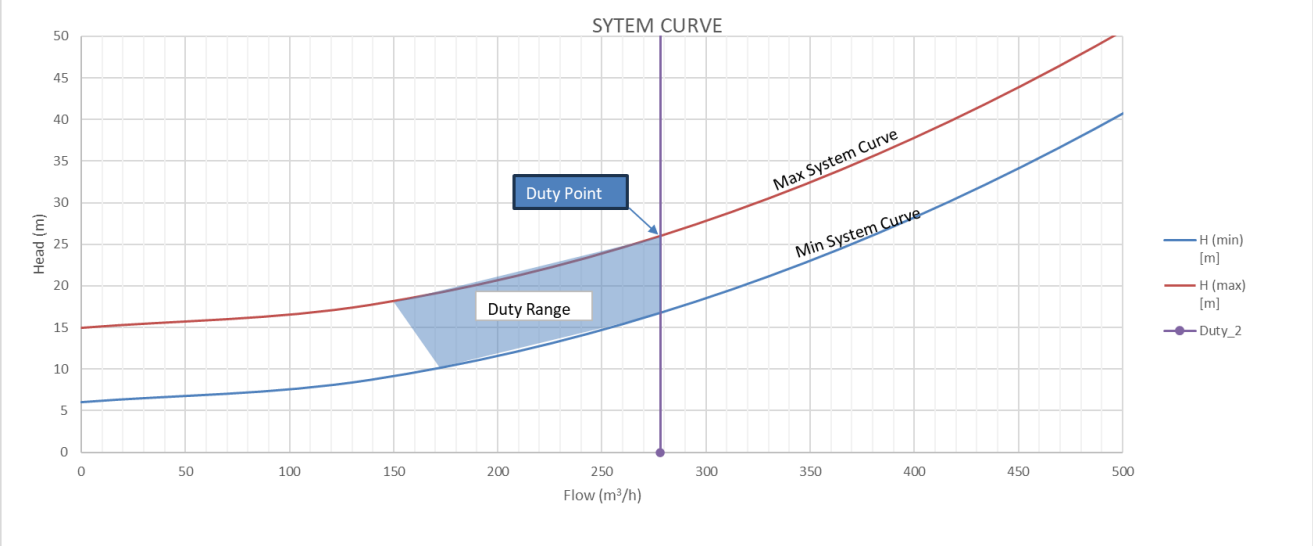
2.2.4.1 Filter Feed Pumps

Filter Feed Pumps

Equipment No.	Description	Specifications	
• 050P001 • 050P002 •	• Filter Feed Pumps (1+1) (Centrifugal)	Maximum duty flow rate for 1 pump	280 m^3/hr
	Pumps settled water to the pressure filters (current phase) and to the future rapid gravity sand filters.	System design range	As per System Curve below
		Max head	26m WC
		VSD	Yes
		Max rpm	1500

System Curve

The Contractor shall select pumps that can achieve all the duty points with design range (highlighted area in the graph below) by varying the motor frequency between 35 – 50Hz. If required for the application and approved by the Engineer, the motor frequency can go down to 25 Hz, provided that forced cooling of the motor is included.



Filter Feed Pumps Control Philosophy

The pumps are connected to the filter feed sump sump in a dry-well flooded-suction configuration. An ultrasonic/radar level sensors in the suction sump relays the water level in the tank to the PLC. This is also used to protect the pumps if the water level reduces below the minimum.

Since the feed rate to the WTW is controlled at the abstraction point from the canal, the filter feed pumps will essentially take away what enters the sump. Hence the pumps will be controlled by VSD's targeting a level of approximately 50% in the sump. The VSD's will ramp up and down in order to maintain this level. When a low level is reached in the sump the pumps will stop to protect the pumps from pulling a vortex and from running dry. The pumps will start when the sump is approximately 70% full.

Float level switches will be provided as additional safeguards to the level sensors, to stop the pumps at a low level and alarm at a high level.

All bends in the pump station shall be medium or long radius. The Contractor shall supply and install all suction and delivery pipework and fittings up to the pump station wall as indicated on the P&IDs.

The pumps shall operate as 1 duty and 1 standby units. If a pump on one line is defective the system shall automatically select the next line. With each activation, the duty lines (pumps) shall cycle to ensure that all the equipment gets approximately equal run-hours.

2.2.5 Electrical Motors

Electrical Motors shall comply with Mechanical Specification:0 2.5 Electric **Motors**.

2.2.6 Baseplates

Base Plates shall comply with Mechanical Specification: 0 1.2.16 **Baseplates**.

All baseplates must be fitted with a minimum of 8 anchor bolts. The diameter of the anchor bolts must be a minimum of 12 mm and for larger pumps (> 100 mm inlet diameter) the anchor bolt diameter must be 12 + (inlet diameter – 100)/25 rounded up the nearest standard size.

2.2.7 Pipework General

All pipe sizes are to be as per P&IDs and comply with Mechanical Specification. If no pipe size is indicated, the following will apply to this section:

i) Maximum suction pipe velocity ≤ 0.7 m/s;

ii) Maximum delivery pipe velocity ≤ 1.5 m/s.

iii) Flow meter velocity: 1.5 m/s- 2.5 m/s

2.2.8 Valves General

All valves shall be as per the Detailed Mechanical Specification: 0 2.3 **VALVES**.

2.2.9 Materials of Construction

Centrifugal pumps

Base Plates: Hot-dipped galvanized mild steel.
All fasteners (Incl. Anchor Bolts): 304 Stainless Steel
- Pump Shaft material: AISI 4140 Alloy steel

Pipework

All pipework: 304 Stainless Steel

2.2.10 Corrosion Protection

All Motors: IP 55 or painted to specification 0
Valves: Painted to specification 0
Belt Guards: Painted to specification 0
Aluminium Frames: Painted to specification 0
Gearboxes/Actuators: Painted to specification 0
Pump Casings: Painted to specification 0
Base Plates: Painted to specification 0
Acoustic Enclosures: Painted to specification 0
All other equipment either fitted or bought out and installed and not mentioned above: Painted to specification 0

2.2.11 Final Colour

Refer to Detailed Mechanical Specification: 0 2.10 CORROSION PROTECTION AND **PAINT**.

2.2.12 Specific Performance Testing

Performance testing shall comply with Mechanical Specification: 0 1.2.26Pump Performance **Testing**.

Workshop hydraulic pressure testing, and performance testing of the pumps will not be required if the pumps are of a reputable brand with more than 50 separate installations in South Africa and if certified pump curves can be supplied. If these conditions are not met, workshop performance testing will be required at the Contractor's expense, in the presence of the Engineer.

Pumps will be tested on-site to determine whether the installed pump is running on the provided characteristic curve and at the stated efficiency. Pump and motor sets shall be tested for vibration.

2.3 VALVES

2.3.1 General

The valves to be used on the more common applications are specified below.

Where special valves are necessary for special applications, these will be specified in the Detailed Mechanical Specification but, if not, tenderers must select suitable valves and provide details in the tender.

The handwheel, lever, etc. on valves, valve actuators and valve gearboxes to be supplied and installed shall be clockwise closing.

2.3.1.1 Requirements for All Valves

All valves shall comply with the following (unless inapplicable):

i) Valves shall be designed and constructed to ensure reliable operation after long periods of non-operation.

ii) Valves shall be double-flanged unless unavailable or otherwise specified.

iii) Valves and their method of actuation shall be designed to operate under the full pressure rating of the valve.

iv) If not obvious from the configuration, all valves, including valves with gearboxes and valves with actuators, shall be provided with an indication of the current position as well as an indication of the closing and/or the opening direction.

v) Spindle covers shall be provided for valves with rising spindles.

vi) The specific application shall be taken into account in the corrosion protection of valves.

vii) Cast iron valve components, including valve bodies, shall be protected with System – “Fusion Bonded Epoxy” or System – “Hot-Applied Thermoplastic”.

viii) Metal plating of ferrous materials is not an adequate corrosion protection system.

ix) Lever handles on small bore valves and position indicator plates shall be of stainless steel.

x) Fasteners shall be of grade 316 SS, or better. This applies to all fasteners on the body of the valve and its gearbox. Pipework flange bolts are specified elsewhere.

2.3.1.2 Cast Iron Gate Valves with Resilient Seals

Resilient seal gate valves may be used on raw sewage, raw water, effluent and general duties where some solids may be present but must not be used on high solid applications such as sludge and grit duties. The valves shall comply with the following:

i) The valves shall comply with SANS 664 or SANS 665, Class 10 or higher as required.

ii) The valves shall be double-flanged.

iii) Valves shall have rising spindles unless otherwise specified or necessary because of space restrictions. Non-rising spindle valves shall be fitted with indicators showing the valve opening position.

iv) Handwheels shall be of cast-iron.

v) The spindle shall be of grade 316 SS, or better.

vi) Fixing lugs for end of travel limit switches shall be provided

vii) Handwheel size and construction shall permit easy opening of the gate when subjected to a differential pressure equal to the maximum operating pressure anticipated. Suitable gearboxes shall be fitted to provide easy opening when necessary. These gearboxes shall be grease filled.

2.3.1.3 Cast Iron Gate Valves (Wedge Gate)

Wedge gate valves shall be used on raw water and treated water duties but shall not be used on raw sewage, raw water, effluent, sludge and general duties where some solids may be present. The valves shall comply with the following:

i) The valves shall comply with SANS 664 or SANS 665, Class 10 or higher as required.

ii) The valves shall be double flanged.

iii) The material of the body seat and the material of the gate trim shall be of copper alloy or stainless steel.

iv) The body shall be provided with channel guides for gate travel. The gate shall be provided with shoes which slide within the channel guides. Guides and shoes shall be of a copper based alloy or of stainless steel and shall guide the gate along the complete travel distance.

v) Fixing lugs for end of travel limit switches shall be provided.

vi) Valves shall have rising spindles unless otherwise specified or necessary because of space restrictions. Non-rising spindle valves shall be fitted with indicators showing the gate position.

vii) The spindle shall be of grade 316 SS, or better.

viii) Handwheels shall be of cast-iron. Handwheel size and construction shall permit easy opening of the gate when subjected to a differential pressure equal to the maximum operating pressure anticipated. Suitable gearboxes shall be fitted to provide easy opening when necessary. These gearboxes shall be grease filled.

ix) Valves larger than DN 150 shall be provided with bypass arrangements, normally isolated by brass ball valves.

x) Valves larger than DN 250 shall be provided with doors for inspection and cleaning.

xi) The valves shall comply with the additional requirements of W&S-BW015:1993 where applicable.

2.3.1.4 Knife-Gate Valves

Knife-gate valves shall be used on water sludges as well as on primary, waste activated and digested sludge duties. They shall also be used on raw sewage and other liquid/solids application and may be used for duties specified under Clause "Cast Iron Gate Valves with Resilient Seals".

The valves shall comply with the following:

i) Valves shall have cast iron bodies, stainless steel blades, cast handwheels, and shall have no carbon steel parts.

ii) Valves shall be clockwise closing (with the exception of valves for the Bulk Water Branch which shall be anti-clockwise closing).

iii) Valves shall have chamfered blade edges and resilient body seals.

iv) Blade faces shall be surface ground or otherwise provided with two flat, parallel surfaces.

v) The blade seal shall be protected by a non-metallic scraper or similar device.

vi) Suitable sealing shall be provided to prevent leakage from the valve and it shall be possible to adjust these seals while the valve is in line under pressure.

vii) Valves shall be droptight but need not be designed for bi-directional flow unless called for in the Detailed Mechanical Specification.

viii) Internal and external surfaces of the valve body shall be protected with a water resistant, non-toxic and non-tainting, FBE pipe coating in accordance with System – “Fusion Bonded Epoxy”.

ix) Valves shall be double-flanged and shall suit the standard flange rating but may incorporate drilled and tapped fastener holes (wafer type valves will be considered for acceptance only where it is unlikely that the pipe or flanged item on either side will have to be removed or if isolation will not be necessary if it is removed). Fasteners may be studs or setscrews manufactured to suit the tapping depth.

2.3.1.5 Waterworks Type Butterfly Valve

These are the type which utilise a replaceable rubber seal with retaining ring and shall be used on raw and potable water duties. Valves shall comply with W&S-BW001:1995.

2.3.1.6 Resilient Seal Butterfly Valves

These are the type which either utilise a resilient body liner with a stainless steel disc or utilise a resilient-lined disc for sealing. They may be used on air, gas and clean liquid duties where approved by the Engineer and shall comply with the following:

i) Shafts and fittings shall be of stainless steel and bearing bushes shall be of Teflon or similar. Seals shall be selected to suit the application. No carbon steel components shall be permitted internally and externally such components shall be properly protected.

ii) Valves shall be air, gas and water-tight when closed, as applicable.

iii) Hand lever valve actuation with a locking system for incremental valve setting from fully shut to fully open shall be provided for valves up to and including DN 200. Valves larger than DN 200 shall be equipped with robust, weatherproof grease-filled gearboxes with an indicator to show the degree of valve opening.

iv) For normal usage, the valves may be of the type which is clamped between two flanges. Where it is necessary to remove equipment on either side for maintenance purposes, suitable spacer pipes must be provided or the valves shall be flanged and provided with drilled and tapped holes.

v) The valves shall be installed with their disc shafts in horizontal orientation.

2.3.1.7 Bronze Isolating Valves

These may be used for isolating duties on clean air and liquid duties up to DN 50.

Bronze gate valves shall be to SANS 776.

Ball or plug valves of appropriate construction may also be used where preferred.

2.3.1.8 Diaphragm Valves

Diaphragm valves may be used on air, sewage, sludge and other dirty or corrosive liquid duties as well as clean liquid duties. The diaphragm material shall be suitable for the fluid to be carried.

Valves shall be double-flanged and shall preferably be of the straight-through type. The weir type may be used for control valve duties. The design shall allow for replacement of the diaphragm without removal of the flanges from the line.

This type of valve shall not be used on the suction side of pumps or on any line subject to vacuum unless designed specifically to cope with design conditions.

2.3.1.9 Needle Valves (above DN 150)

Needle valves, VAG Plunger Valve or equivalent, shall be used for the regulation of flow and/or pressure in pipelines containing water where the size is DN 150 or greater unless this is overridden by the requirements of the Detailed Mechanical Specification. The configuration shall be double-flanged with co-axial flanges unless otherwise specified.

The seal seat and associated downstream parts shall be selected to prevent any cavitation for the application. Such parts shall be of stainless steel or copper based alloy.

2.3.1.10 Telescopic Overflow Valves

Telescopic overflow valves, (Fulton, or equivalent), shall be vertically mounted and shall be specifically designed for the purpose intended.

Operation shall be by handwheel mounted on an independently mounted headstock. Rising spindles are preferred. The outer tube shall be flanged and bolted to a similarly flanged vertical pipe. The inner tube shall incorporate a conical bellmouth. The bridge connnecting the inner tube to the valve's spindle shall be attached to the outside of the bellmouth in order to limit the effect of fouling rags, etc.

The spindle shall be of grade 316 SS, or better. The outer tube and inner tube shall be of 3CR12.

The headstock and handwheel shall be of painted cast iron or painted 3CR12.

2.3.1.11 Level Control Valves

Level control valves which do not incorporate pilot control are preferred, VOSA Series 7354 or equivalent.

Level control valves which incorporate pilot control shall be simple to check and to maintain. A suitably sized strainer shall be provided to prevent blockage of the pilot. The strainer shall be self-cleaning or shall be easily cleaned.

Level control valves which are not proprietary items and which incorporate linkages shall be designed with overall strength and rigidity in mind. The design shall incorporate an allowance for fatigue effects.

2.3.1.12 CHECK VALVES

General

Where special valves are necessary for special applications, these will be specified in the Detailed Mechanical Specification but, if not, tenderers must select suitable valves and provide details in the tender. Check valves to be used on the more common applications are specified below.

Single-door and double-door check valves shall comply with SANS 1551-1 unless overridden by the requirements of this Clause.

Bronze swing type check valves may be used for pipework up to DN 50.

Requirements for All Check Valves

Check valve installations shall comply with the following:

i) Valves shall be designed and constructed to ensure reliable operation after long periods of non-operation.

ii) Valves shall be double-flanged unless unavailable or otherwise specified.

iii) Valves shall be designed to function correctly under the full pressure rating of the valve.

iv) The specific application shall be taken into account in the corrosion protection of valves. Steel and cast iron valve components, including valve bodies, shall be protected with System –

v) "Fusion Bonded Epoxy" or System – "Hot-Applied Thermoplastic".

vi) Fasteners shall be of grade 316 SS, or better. Flange fasteners are specified elsewhere.

vii) Check valves shall be sized to open fully at the system's design flow rate.

viii) The check valve installation shall ensure that the valve is able to operate without interference from a physical obstruction such as a shut-off valve, bend, mortar lining, etc. Where a check valve is located close to another valve, a straight pipe shall be provided and this shall have a flange-to-flange length of not less than 1,5 times the valve diameter.

ix) Indelible body markings, as per SANS 1551-1, shall include the manufacturer's name, pressure rating (PN), nominal size (DN) and the direction of flow.

x) A shut-off valve shall be installed downstream of each check valve.

Axially-Sprung Check Valves for Water

Axially-sprung check valves (nozzle check valves) for treated water and raw water duty shall be double-flanged; RGR Concentric, Vent-O-Mat Maxiflo or equivalent.

The valve design shall prevent shock closing and shall incorporate a hydrodynamically efficient flow path to minimise head loss.

The spring shall be of stainless steel and the guide rod shall be supported within a non-corroding, non-galling bearing material.

Double-Flap Check Valves for Water

Double-flap check valves for treated water and raw water duty shall be of the positive-closing type; Crane Duo-Chek II or equivalent.

Bodies shall be of cast-iron or cast-steel. Flaps shall be of the light, leaf type, shall be of bronze or stainless steel with machined sealing faces, shall be specifically designed to be non-sticking, and shall have teflon bearing washers. Seals shall be of resilient material. The axis of rotation of the flaps shall be vertical, pins shall be of 316 SS, or better, and closure shall be initiated by stainless steel springs, suitably rated for the duty so that closing is initiated prior to the onset of reverse flow.

Positive, external indication of the position of both plates shall be provided.

Rubber Diaphragm Check Valves

Rubber diaphragm check valves shall be of the double-flanged configuration and shall incorporate a hydrodynamically efficient flow path to minimise head loss; VAG Top-Stop or equivalent. Valves featuring multiple small orifices will only be acceptable for nominal flow speeds below 0,5 metres/second.

The flexible rubber diaphragm shall be replaceable.

Ball Check Valves

Ball check valves, AVK Series 53 or equivalent, may be used on sewage, sludge or similar applications.

The ball shall be rubber coated and it shall be possible to inspect and/or replace it without removing the valve from the pipework.

Swing Check Valves

Suitably designed swing check valves may be used on sewage, sludge or similar applications.

Orientation of the valve shall comply with the manufacturer's recommendation.

Swing check valves shall:

i) be of double-flanged configuration.

ii) have ductile iron bodies.

iii) be suitable for a working pressure of at least 1 000 KPa.

iv) be fitted with a side lever and adjustable weight.

v) be provided with a bolted cover which provides access, without dismantling or removing the valve, to the swing flap.

vi) have stainless steel hinge pins.

vii) have engineered plastic or non-ferrous bearings.

2.3.1.13 AIR RELEASE VALVES

General

Air release valves for water pipework shall be of the non-slamming type, A.R.I. or Vent-O-Mat or equivalent.

Valves for sewage and similar duties shall be specifically designed for the application.

Arrangement and Installation

Air valves shall be installed above pockets designed to collect the air entrained with the water flow. The pockets shall be designed in accordance with the requirements for nozzles in the Clause "Pipework". The diameter of the nozzle shall be at least half the diameter of the parent pipework.

Valves shall have flanged connections and shall be provided with upstream isolating cocks.

2.3.2 Corrosion Protection

Valves: Painted to specification 0

2.3.3 Final Colour

Refer to Detailed Mechanical Specification: 0 2.10 CORROSION PROTECTION AND **PAINT**.

2.4 Actuators

2.4.1 General

Manual operation, by lever, handwheel, etc., shall be provided on all actuators unless otherwise specified.

The direction of operation of handwheels shall comply with Clause "Valves for Liquids or Gases".

Metal plating of ferrous materials, (e.g. zinc or cadmium plating) is not an adequate corrosion protection system for items such as actuator shafts and such items shall be provided with an additional coating of a semi-setting, thick protective layer, such as a suitable Tectyl product, or equivalent.

2.4.2 Electric Actuators

Electric actuators shall be specifically matched to the design duty. Actuators providing modulating duties shall be specifically designed for continuous modulation.

The actuator motor and gearbox shall form one integrated unit. Motors shall be for three phase, 400 Volt, 50 Hz supply, shall be Class F insulated (or better) and shall have an embedded thermostat for overload protection. The complete unit, including installation work, glands and controls shall be ingress protected to IP 68 unless otherwise specified.

If the opening or closing period is specified in the Detailed Mechanical Specification (e.g. to avoid water hammer) this period shall be achieved, without pulsing, by incorporating a suitable gear ratio to allow the motor to operate from fully open to fully closed without stop/starts.

For open/shut duties, the continuous actuator torque rating shall be at least 200 % of the start-opening or shut-off torque, whichever is higher, specified by the valve manufacturer for this application (after the gearbox mechanical advantage has been taken into account). For modulation duties, the continuous actuator torque rating shall be at least 400 %.

All components of the drive shall be designed to prevent backlash.

Electric actuators shall incorporate the following features:

i) hand operated gearwheel override operation incorporating open/close direction indication.

ii) visual valve position indication at the unit.

iii) the terminal compartment shall be separately sealed from the internal electronics and mechanisms.

iv) the actuator shall initiate a trip if:-

it does not succeed in moving the valve within a suitable period.

the motor windings overheat.

Where specified in the Detailed Mechanical Specification, the following shall be provided:

i) the actuator shall provide an impact effect to overcome:-

tightly seated valves.

an unintended loss of movement.

ii) the following information shall be fed back to the control panel or, if applicable, the SCADA system:-

valve position.

torque on output shaft.

iii) it shall be possible to configure the control instructions and interrogate the actuator status without removing covers.

2.4.3 Pneumatic Actuators

Pneumatic actuators shall be selected to match their valves' operating requirements.

Actuators shall be fabricated of non-corrosive materials and shall be mounted using stainless steel mounts and couplings. Fasteners shall be of stainless steel.

Unless the system configuration clearly does not require it, automatic spring-closing shall be provided to ensure that the valve closes (if open) or remains closed (if closed) upon power failure or failure of the air supply. The spring shall be of stainless steel.

Linear actuators shall be provided with stainless steel cylinder piston, cylinder rod and attachments. For open/shut duties, continuous actuator force rating shall be at least 200 % of the start-opening or shut-off force, whichever is higher, specified by the valve manufacturer for this application (after any mechanical advantage has been taken into account). For modulation duties, continuous actuator force rating shall be at least 400%.

2.5 Electric Motors

2.5.1 Rating

All electric motors shall be rated for operation on a 3-phase, 4-wire, 400/230 volt, 50 Hz, AC supply at sea level, with an ambient temperature of up to 40 ºC.

The rated power of the motor shall be selected to be not less than 20 % in excess of the designed power requirement of the associated plant unless the motor forms part of a packaged unit and/or where the size of the motor is specified and/or as otherwise approved by the Engineer.

A motor shall be selected so that it shall reach full operating speed within 10 seconds for the method of starting and drive arrangement used.

2.5.2 Specifications

Except as otherwise specified, motors shall be standard squirrel cage or slip-ring motors complying with SANS 1804 as amended, with IP55 enclosure and IC 0141 cooling, and suitable for a damp environment. Motors shall be suitable for both "continuous running duty", Duty Class S1, and "intermittent periodic duty", Duty Class S3. Windings shall be copper conductors insulated with Class F material (100 ºC rise capability) with Class B temperature rise (80 ºC). The motors shall be suitable for 6 starts per hour, two of which shall be consecutive.

2.5.3 Type

The type of motor (and starter if applicable) to be supplied is determined by the requirements of the application specified in the Detailed Mechanical Specification and by the starting limitations specified in the Electrical Specification. In the absence of such specifications, a standard squirrel cage motor complying with this Clause shall be offered.

2.5.4 Construction

Motor frames shall be of the totally enclosed fan cooled type with cast iron yoke frames and cast iron end covers. Sheet steel is not acceptable for fan cowls and these shall be of cast iron, tough plastic or stainless steel. The end covers and yoke shall be properly machined and each cover shall locate on a spigoted register to ensure concentricity and parallelism. Bearings shall be of grease lubricated roller and/or ball type, provided with grease nipples (with extension tubes where access is restricted) and sealed to suit external use. Motors required for external use shall be fully weatherproofed.

2.5.5 Terminal Boxes

Terminal boxes shall be top mounted wherever possible and arranged for cable entry from either side. The two ends of each stator winding shall be "brought out" to the terminal box. Squirrel cage motors shall be wired to permit both direct-on-line and star-delta starting.

2.5.6 Thermistors

Motors of 55 kW and up to (but not including) 150 kW, as well as motors for variable speed drives shall be provided with thermistors embedded in the windings of each phase. The thermistor tails shall be "brought out" to separate terminals mounted near the motor winding terminal block.

2.5.7 RTDs

Motors rated at 150 kW and above, both fixed and variable speed, shall be provided with PT 100 type RTDs. Two RTDs shall be provided per phase winding. All six shall be incorporated into the control system; three to provide monitoring and three to provide high temperature trip functions.

2.5.8 Heaters

Motors of size 75 kW and above shall be fitted with "pocket" heaters. The heater shall be mounted at the bottom of the motor frame and shall be replaceable without dismantling the motor. These shall be arranged to switch on when the motor stops operating and switch off when it starts operating.

2.5.9 Slip-Ring Motors

Slip-ring (wound rotor) motors shall be of the totally enclosed fan cooled type with stainless steel slip-rings. The slip-rings shall be mounted inboard of the non-drive end bearing and shall be fitted and keyed to the shaft as a single unit. The terminal box shall be common to both stator and rotor connections.

The brush holders shall be manufactured from fibreglass and shall be removable from the terminal box as a complete unit. Where the current density in a single brush at the full operating load approaches or is above 80 % of the capability of the brush, then an additional brush shall be provided in a separate brush box.

2.5.10 Motor Speed

Motor speeds shall be selected as follows:

i) motors with ratings below 30 kW can have nominal speeds up to 3 000 rpm.

ii) preference shall be given to motors with nominal speeds up to 1 500 rpm for ratings between 30 kW and 132 kW, both inclusive.

iii) motors with ratings above 132 kW shall have a nominal speed of 1 500 rpm or below.

2.5.11 Variable Speed Applications

In applications where the motor speed is controlled by variable frequency drive, the motors shall be cooled by a separate, 50 Hz motor driven "piggy-back" fan. This requirement will be waived if the Contractor can provide documentation to confirm that the drive and motor design can operate in the application, with shaft-mounted fan, without overheating. This requirement does not apply to submerged motor applications.

2.5.12 Hazardous Locations

When required to suit a hazardous location in terms of SANS 10108 or in terms of this Specification, suitable motors complying with SANS 60034-5 or SANS 61241, as appropriate, shall be supplied. The relevant SANS certificates, clearly indicating the location classification in which the machine may be operated, shall be submitted to the Engineer before delivery of the motors. Each motor shall be clearly and permanently marked with the applicable certificate number.

2.5.13 Special Motors

Should the Tenderer wish to offer a different type of motor to those specified so as to obtain special starting characteristics and/or variable speed, a full technical specification of the motor must be supplied and such specification shall be for equipment to a standard at least equal to that of the motors specified above. In particular, no item of electrical protection shall be omitted.

2.5.14 Warning

Motor manufacturers must be warned that the motors are to be installed in an extremely corrosive and often damp environment. All motors shall therefore be adequately protected against corrosion.

2.6 INSTRUMENTATION

2.6.1 General

Environmental protection of electronic instrumentation shall be as follows:

i) Instrumentation and associated displays and transmitters which are either located inside or located outside and above ground level shall have IP 55, or higher, rating.

ii) Instrumentation and associated displays and transmitters which are located in underground chambers shall have IP 68 environmental protection. The instrument shall be mounted in an enclosure which shall provide physical protection and shall be self-draining.

iii) Instruments and associated displays and transmitters which are located outside buildings shall be mounted in enclosures. Enclosures shall be of polycarbonate construction with transparent front, Fibox EK or equivalent. The complete enclosure installation shall have an IP 55 rating or higher. The enclosure size shall be chosen to provide a clearance of at least 100 mm all-round the instrument.

Instruments and their cabling shall be protected so that electromagnetic interference does not affect their operation and signal transmission.

Calibration certificates shall be included in the Manual.

2.6.2 Scope

This section covers the following new valves and associated equipment and should be read in conjunction with the P&IDs.

2.6.3 Equipment Data and Duties

Turbidity Meters

Equipment No.	Description	Specifications	
• 50 AIT (NTU) 01	Turbidity Meter	NTU Range	0 - 30
	• Filtrate	Liquid	Potable water
		Transmitter position	Integral / Remote
		Local Display	No
		Distance from MCC	To be determined by Contractor
		Communication protocol	Modbus RTU
		Environmental Protection	IP68
		Units	NTU

2.7 PIPEWORK

2.7.1 General

2.7.1.1 Pipes and Fittings

Steel Pipe – General Duties

Steel pipes for general non-corrosive, non-abrasive duties for liquid, air and gas shall be as follows:

Up to DN 150	-	SANS 62 medium class.
Over DN 150	-	SANS 719.

Unless otherwise specified, steel pipework and fittings shall be hot-dip galvanised and painted.

Steel Pipework – Design

Pipework up to DN 600 shall be in accordance with SANS 1476. Pipework for the conveyance of water shall, in addition, comply with CCT-WS 11 Standard Specification for Steel Pipe, Fittings and Specials.

Stainless Steel Pipework

Stainless steel pipework shall be to ASTM 312. Schedule 10 pipes and fittings shall be used except where otherwise specified.

Steam Pipework

Steam pipework smaller than DN 50 shall be of 316 stainless steel to ASTM A-312 Schedule 40 or approved equal. Steam pipework DN 50 and larger shall be manufactured to SANS 62 heavy class, ANSI B36.10 STD/Schedule 40 or to BS 1600 Schedule 40. Steel pipework shall be supplied with a suitable temporary corrosion protection both internally and externally in order to prevent corrosion during the storage, installation and pre-commissioning period. A primer similar to Plascon SNK 2, phenolic modified polyvinyl butyral self-etch primer, would be suitable.

Hydraulic and Oil Pipework

Hydraulic pipework shall be to BS 778 or equal. All hydraulic and oil pipes and fittings shall be thoroughly degreased, descaled and cleaned internally and externally after fabrication by abrasive blasting or pickling, thoroughly cleaned and rinsed, dipped in a hot iron phosphate solution and coated internally with a corrosion inhibiting, oil soluble preservative. After treatment and drying all openings shall be sealed until the pipes are installed.

Butt Weld Fittings

Steel butt welding pipe fittings shall be to ANSI B 16.9, BS 1965 or BS 1640 of the same schedule as the pipework or heavier. Butt weld fittings in stainless steel shall be to ASA B 36.19 for schedule 5S and 10S and ASA B 16.9 for schedule 40S and 80S. Alternatively, fittings may be to BS 1640.

Malleable Cast Iron

Malleable cast iron fittings shall be to SANS 14.

Cast Iron

Cast iron pipes and fittings shall comply with BS 2035 (Class D) and shall be pressure tested in accordance with Clause 12 of that Standard. The requirements of the Standard's Clause 6 regarding freedom from defects and casting appearance and Clauses 8, 9 and 10 regarding casting accuracy will be strictly applied. The requirements of the Standard with regard to protection and flanges shall be modified to comply with this Specification. Also refer to Clause "Castings" of this Specification.

Copper

Copper pipes shall be to BS 2871 or approved equal.

Plastic Pipework

Polyethylene or Polypropylene pipes shall comply with SANS 533 and SANS 1315 respectively and shall carry the SABS mark. The contractor manufacturing and installing the pipework shall satisfy the requirements of SANS 9001. PVC pipework is not acceptable except where specified. An operating life of 50 years shall be designed for and appropriate derating factors shall be applied to suit the application. The rated maximum working pressure at operating conditions of the class of pipe selected shall be not less than 1,5 times the actual maximum operating pressure. If the material used has insufficient resistance to solar radiation (U.V. light) for the application, suitable protection must be provided to achieve the required life. **Note that nominal bores and pipe diameters specified must be regarded as the minimum inside diameter.**

2.7.1.2 Pipework Design

Pipe Type and Material

The type and material of pipe to be used will be given in the Detailed Mechanical Specification.

Pipe Diameters

Unless otherwise specified in the Detailed Mechanical Specification, pipe diameters shall be based on the following velocities. The velocities shall be based on the compressed volume at the operating pressure in the case of steam, air and other gases. Valves and other ancillaries shall generally be of the same nominal diameter as the pipe. Non-standard sizes shall not be used.

Fluid	Fluid Flow (l/s)			
	0-2.5	2.5-15	15-100	100-500
	Allowable flow velocity (m/s)			
Liquid				
Grit Free	0.75max	1.25max	1.5max	2max
High Solids or grit		0.8min	1min	1min
		1.5max	1.75max	2max
Steam	10max	15max	20max	25max
Air and Gas				
Above 10kPa	5max	8max	10max	12max
Below 10kPa	2.5max	3max	4max	5max

Coupling Arrangement

Screwed fittings may be used on DN 50 and smaller provided that sufficient unions or flanges are provided for disassembly and removal of equipment. Reducing sockets and reducing bushes shall be used where required.

All steel pipes larger than DN 50 shall be flanged or fitted with mechanical pipe couplings as applicable.

Suitable pipe couplings shall be incorporated wherever necessary to facilitate maintenance or isolate vibration. A coupling shall be provided on each pump suction. Couplings shall be adequately restrained by harnesses as specified in the Clause "Pipe Couplings".

Draining, Venting and Purging

On liquid lines provision shall be made for draining and venting where necessary. Vents shall be provided at all vertical down bends on gravity lines. On gas lines provision shall be made for purging.

Condensate Drains for Air Lines

Automatic condensate traps with isolating valves and valved by-passes shall be provided at all necessary points including ahead of any globe type valve, orifice plate or concentric reducer in a horizontal line, at each change of level and immediately ahead of the user equipment.

A suitable well of a diameter equal to the pipe diameter with a bottom drain shall be provided at each condensate removal point. Condensate traps and valves shall be accessible and condensate shall be piped to the nearest drain. Pipework shall be sloped in the direction of flow towards a drain point with a slope of 1 in 150 and care shall be taken to avoid sagging at any point.

By-Passes

Isolating valves and valved by-passes shall be provided around condensate traps, pressure reducing valves and valves with solenoid or other actuation which do not have provision for manual operation.

Encased Pipes

Pipework to be permanently encased in concrete, cement or similar shall be of cast iron or 316 SS, or better, for steel and stainless steel pipework respectively. The encased portion shall be a short, straight length of pipe, flanged both ends with adequate clearance between the wall surface and the flanges for inserting flange bolts. Victaulic type couplings may in some instances be permitted instead of flanges.

Pipe sections through walls below ground or water level shall be provided with a puddle flange the same diameter as a standard flange. The encased area shall in such cases be uncoated up to
30 mm inside the wall surface and coated to Specification from there on.

Isolation

The layout design shall make provision for isolation and easy removal of mechanical equipment.

Nozzles for Fittings, Gauges, etc.

Nozzles on pipework (for installation of gauges, transmitters, drain pipes, cooling water take-offs, air release valves, etc.) shall be designed so that the pipework corrosion prevention system is not affected.

Nozzles shall consist of a flanged, welded tee-off of at least 100 mm diameter, painted or cement-lined internally and provided with a non-corrosive blank flange, e.g. grade 316 stainless steel. The blank flange shall be provided with tapped holes suitable for the equipment installation.

Internally painted, small diameter carbon steel nozzles and screwed carbon steel tee-offs are not acceptable. Carbon steel pipework may be provided with small diameter, grade 316 stainless steel nozzles which are welded into the pipework if the Engineer considers this acceptable in the application.

Flow Straighteners

If a flow straightener is specified in the Detailed Mechanical Specification, this shall be provided in accordance with drawing number ME-A4/1520: Pump Suction Flow Straightener – Plain Ended Pipe. This design is for plain ended pipes on the suction side of pumps but the blade configuration shall apply where applicable to other applications.

2.7.1.3 Pipework Installation

Appearance

Pipes and fittings shall be conservatively selected to suit the application, neatly installed, straight to line and level, adequately supported and shall operate without vibration.

Valve Orientation

On sludge or raw sewage pipelines, check valves shall, wherever possible, be mounted horizontally and isolating valves with spindles vertical. Valve handwheels shall be arranged so that they are accessible to the operators.

Supports

Proposed designs of pipe supports shall be submitted to the Engineer for acceptance prior to manufacture. Specific requirements are:

i) Steel supports shall be fabricated from heavy duty hot-rolled steel sections. The complete assembly shall be hot-dip galvanised after all fabrication is completed.

ii) Welds shall be “all-round”.

iii) Each foot shall feature at least four anchor fasteners.

iv) For cantilevered pipe supports, the spacing between anchor fasteners shall be not less than one third of the cantilevered length

The spacing between pipe supports shall be as follows:

APPROXIMATE DISTANCE BETWEEN SUPPORTS FOR STEEL PIPE	
Pipe Diameter (DN)	Distance Between Supports (mm)
0 – 15	800
20 -50	1500
65 – 100	2500
125 – 100	3500
250 - 500	5000
>500	6000
Distance between supports must be halved for pipe materials other than carbon steels and stainless steels.	

Pipe supports shall be so located that when an item of mechanical equipment is removed, the associated valves and pipework are still adequately supported. Supports shall be provided close to heavy items such as valves. No external loads shall be placed on items of mechanical equipment such as pumps, compressors, etc. Adequate provision shall be made for expansion and contraction due to variations in temperature or pressure.

3 mm thick neoprene strips shall be placed between pipes and supports or clamps to protect the paintwork and limit corrosion. Where roller or sliding supports are used to accommodate movement, suitable wear blocks shall be fixed to the pipe to prevent damage.

Floor pipe supports shall be aligned using a nut above and below the foot. A space of at least 20 mm shall be left between the foot and the floor and this space shall be filled using non-shrink grout in accordance with the manufacturer's recommendations once alignment has been completed. Alternative designs and installations may be submitted by the Contractor. Wall pipe supports shall be similar.

Where the Engineer approves the use of concrete pipe supports to be built by a civil contractor under a separate contract, these will be constructed after installation of the pipework and temporary supports shall be provided by the Contractor in positions which will not interfere with the construction of the concrete supports.

Pressure Testing

All pipelines shall be pressure tested to 1,5 times maximum working pressure. This shall be done before covering up the pipeline in any way where applicable and shall be witnessed by the Engineer.

2.7.1.4 Pipework for Pump Suction

General

Pump suction pipework shall be designed in accordance with good engineering practice. The following, in particular, shall be complied with:

i) Suction pipework shall be sized, where practical, to ensure that the flow speed is no higher than 1,5 m/s.

ii) High points shall be avoided and it is preferred that the pipework slopes up toward the pump.

iii) Air leaks shall be avoided / prevented.

iv) Reducers shall be of the unequal type.

v) Reducers shall have a diametral reduction of no more than 50 mm per 300 mm length and shall have a parallel-sided length between the tapered portion and each flange.

vi) “Lobster-back bends” shall have a minimum of five segments. The segments welded to the pipe flanges shall be perpendicular those flanges.

vii) Flow straighteners shall be provided where specified in the Detailed Mechanical Specification.

viii) Strainers shall be provided where specified in the Detailed Mechanical Specification.

Bell-Mouths

All pump suction piping which draws the pumped liquid from open sumps shall be provided with bell-mouth inlets. The bell-mouth shall have an integral flange and shall be bolted to a flange on the suction pipework.

The bell-mouth design shall be in accordance with drawing EAM_ME_2015_001.

The preferred material for the bell-mouth is glass-fibre or stainless steel 316 however cast iron suitably coated, may be acceptable.

2.7.1.5 Flanges

Standards

All standard flanges shall comply with SANS 1123. For flange sizes not included in the SANS, BS 4504 shall be used. Cast iron flanges and their mating flanges shall have flat faces. The flange table shall be as specified or, if not specified, selected to suit the maximum possible operating pressure but not less than Table 1000. Drilling and installation of flanges shall be "off-centre".

Flange Fixing

Flanges DN 50 and smaller may be of the screwed on type. Metal flanges above DN 50 shall be welded on in accordance with BS 806 Type 6 unless otherwise agreed or specified.

Machining of Flanges

All flanges shall be machined on the sealing face. Flanges cut from plate shall also be machined on the bore and outside diameter. Cast iron flanges shall also be machined or spot faced on the back of the flange to ensure a flat bearing surface for the fastener's head or nut and washer. All edges, including bolt-holes, shall be chamfered or rounded to a 2 mm radius.

Butt Flanges

If the use of a loose hot-dip galvanized butt flange arrangement with stainless steel pipework is specified or approved by the Engineer, such arrangement and design shall comply with BS 4504 Table 6/6 or 10/6 as appropriate. The butt welded shouldered end for the pipe may be rolled from hot rolled stainless steel angle section. The hot-dip galvanized butt flange must be electrically insulated from the stainless steel pipework.

Gaskets

The jointing material used on flange joints shall be of rubber or compressed asbestos fibre at least 3 mm thick complying respectively with BS 2494 or BS 1832, as applicable. Full face gaskets shall be used for full face flanges. Inner bolt circle gaskets shall be used on raised face

flanges and when clamping items such as wafer type valves between flanges inside the bolt circle. Properly designed O-ring seals are also acceptable.

2.7.1.6 Pipe Couplings

General

Where pipework movement, misalignment or dismantling must be allowed for, or if necessary for any other reason, pipe couplings may be used if approved by the Engineer. Pipe couplings shall be of the mechanical type, stainless steel bellows type or rubber bellows type.

Supports and Anchors

Pipework using couplings shall be supported and anchored strictly in accordance with the coupling manufacturer's recommendations.

If the pipework configuration does not provide axial restraint, harnesses against separating forces shall be provided. Systems incorporating additional flanges or lugs and connected by tie bars or positively fixed to anchors will be acceptable. Systems relying purely on friction will not be acceptable. Tie bar harnesses shall incorporate three tie bars or more.

Mechanical Pipe Couplings

Mechanical pipe couplings shall:

i) be of rolled steel, forgings or of high grade castings;

ii) be coated;

iii) have rubber seals of a suitable grade;

iv) shall have stainless steel fasteners, and,

v) be supplied without centre register unless otherwise specified.

Pipe ends shall be in accordance with the coupling manufacturer's recommendations. Where machining is required, as in the case of cast iron pipes, the length of machining on each pipe shall be approximately equal to the total length of the coupling to ensure that the coupling can be separated for pipe removal.

Couplings for air applications below 60 ºC shall be hot-dip galvanized for air applications above 60 ºC shall be of stainless steel. Couplings for liquid applications shall be coated in accordance with System – “Hot-Applied Thermoplastic” or System – “Fusion Bonded Epoxy”. Couplings for stainless steel pipework shall be stainless steel.

Fasteners, including coupling studs, **stub studs** (i.e. studs welded to the flanges of flange adaptors), washers and nuts shall be of grade 316 SS, or better.

When couplings are part of a buried pipeline, the metallic surfaces shall be coated as specified above and then covered and wrapped. Couplings shall be covered with mastic to a smooth finish, wrapped with tape and then wrapped with a polythene sheet which is strapped in place. "Denso mastic" and "Denso tape", or equivalent products, are suitable. If the operating temperature is likely to exceed 70 ºC, the mastic and tape shall be replaced with suitable grease or a suitable sealer.

Stainless Steel Bellows Pipe Couplings

Stainless steel bellows shall incorporate stainless steel flanges and fasteners.

Rubber Bellows Pipe Couplings

Rubber bellows couplings are acceptable for machinery which is flexibly mounted and also in applications which require isolation of driven machinery from the surrounding pipework and/or structures.

The flexible material used for rubber expansion joints shall be chosen specifically for maximum resistance to bursting.

Metal backing flanges for rubber expansion joints shall be of stainless steel or hot-dip galvanized steel.

2.7.2 Final Colour

Refer to Detailed Mechanical Specification: 0 2.10 CORROSION PROTECTION AND **PAINT**.

2.8 LIFTING EQUIPMENT

2.8.1 General

2.8.1.1 General Requirements

Lifting equipment shall comply with the following general requirements:

i) The design, fabrication and installation of lifting equipment shall be fully in accordance with the relevant aspects of the Occupational Health and Safety Act and Regulations.

ii) Lifting equipment shall be designed, constructed and installed in accordance with an internationally accepted technical design standard.

The guidelines given in the Southern African Steel Construction Handbook may be used where applicable and where these do not conflict with the internationally accepted technical design standard.

iii) Test certificates shall be provided for all items of lifting equipment.

iv) The safe working load (SWL) shall be permanently marked on all items of lifting equipment.

v) Lifting equipment and installations shall be inspected and shall be tested over the complete lifting range using a test load.

Unless otherwise specified in the internationally accepted technical design standard, the test load shall be:

vi) at least 125 % of the SWL for equipment with a SWL of up to 10 tonne SWL;

vii) at least 110 % of the SWL for equipment with a SWL of 10 tonne and above.

viii) High-tensile and alloy steel chains shall have a factor of safety of at least four. Other chains shall have a factor of safety of at least five.

ix) Steel-wire ropes shall have a factor of safety of at least six. Man-made fibre ropes or woven webbing shall have a factor of safety of at least six. Natural fibre ropes shall have a factor of safety of at least ten.

x) Anchor fasteners for securing steel structures to concrete shall have a diameter of not less than M16 and shall be of grade 316 SS, or better.

xi) Foot-plates for columns which form part of lifting gantries shall be secured with a minimum of four anchor bolts.

xii) Hollow steel sections such as pipes and tubing are not acceptable as structural members unless the section is fully closed by welding.

xiii) Tenderers shall note that many aspects, such as fabrication, welding, corrosion protection and fasteners, shall be in accordance with the requirements of other clauses in this Standard Specification for Mechanical Works (including General Works).

2.8.1.2 Steel Gantries

In addition to the general requirements for lifting equipment, steel gantries shall comply with the following:

i) The same internationally accepted technical design standard used for the design of the crawl beam or crane shall be used for designing the gantry which supports the crane or crawl beam.

ii) Columns shall be cross-braced and/or “triangulated” in more than one plane. In other words, columns shall not be cantilevered in any vertical plane.

iii) Gantry steelwork shall be hot-dip galvanised. If this is not feasible, steelwork shall be hot-metal zinc-sprayed, sealed and coated in accordance with the clause 0.

2.8.1.3 Overhead Travelling Cranes

In addition to the general requirements for lifting equipment, overhead travelling cranes shall comply with the requirements below.

General

Construction of the crane shall be in accordance with BS 466 and BS 2573 (or BS EN 13 001), as applicable. All welding of steelwork shall be carried out in accordance with BS EN 1011 by competent artisans meeting the requirements of BS 4872. (Suitable equivalent standards are acceptable).

Design requirements for the fixing and installation of the crane rails shall be provided by the Contractor to the Engineer for acceptance.

The Tenderer shall determine a suitable method of installation for the crane and the crane rails and shall manage all work accordingly.

The Contractor may use the crane during the installation of other parts of the Works on condition that all testing and certification for the complete lifting installation, including the supporting structure, has been successfully completed.

Certificate

The Contractor shall supply to the Engineer a certificate from the crane manufacturer which:

i) certifies that the crane has been manufactured in accordance with the requirements of the Driven Machinery Regulations of the Occupational Health and Safety Act;

ii) specifies the internationally accepted technical design standard used, and;

iii) states the SWL and the test load.

This certificate shall be provided to the Engineer prior to delivery of the crane to Site.

Configuration

The overall configuration shall be as follows:

i) the crane hoist shall be supported on and travel along a steel crane beam structure.

ii) the crane beam shall be supported on end carriages which travel along crane rails.

iii) the crane rails shall be supported along their full length, either on a concrete beam or on a hot-dip galvanised steel beam structure.

The crane long travel, cross travel and hoist shall be electrically-powered or manually operated as stated in the Detailed Mechanical Specification.

Unless otherwise stated:

i) the lowest hook level shall be floor level.

ii) electrical control pendants shall be arranged to move independently along the length of the crane beam and shall be situated at one metre above floor level.

iii) the operating chains of manually operated cranes shall fall to one metre above floor level.

Construction

All materials shall be new and unused and suited to the application. Structural steelwork shall comply with the requirements of SANS 1431 and the grade used for structural members shall be 300 WC.

Fabrication shall comply with the following:

i) Site welding will not be acceptable.

ii) Welding shall be continuous.

iii) Crevices will not be permitted.

iv) Weld slag and spatter shall be removed and welds shall be ground smooth prior to coating.

v) Welds shall be free of blowholes and undercut.

vi) Edges shall be rounded to a radius of at least 3 mm.

vii) Open pockets which are inaccessible for preparation and coating will not be permitted.

The crane rails shall be standard rail sections. Rails manufactured from square section steel bar will not be acceptable. Rail lengths shall be joined using fish-plates, with at least four fasteners, to provide a continuous path for the travel of the crane wheels.

The crane beam and end carriages shall be designed with suitable dimensions, wheel spacings and gusset plates or diagonal bracing to prevent cross-whipping.

End stops with rubber buffers shall be fitted to prevent the hoist from moving off the travelling beam.

Stops and buffers are also required to limit the long travel on the rails.
Lubrication systems shall be designed to exclude dirt and moisture and all gear wheels shall be fully enclosed.

Bearings shall be mounted in sealed, cast iron bearing housings or in totally enclosed and sealed housings, grease-lubricated and provided with grease nipples in both cases. The open type bearing units with exposed "lubricated for life" bearings will not be acceptable.

Installation

The crane and rails, when erected and installed, shall be of neat and workmanlike appearance, solidly and evenly supported, true to line, level, plumb and in proper working order. The crane rails shall be straight to within the permissible deviations given in BS 466 over their entire length.

The distance between rail supports shall not exceed 1 000 mm. Every rail length shall be supported at both its ends.

Crane rail anchor fasteners shall be M16 or larger and shall be of grade 316 SS or better.

The full length of the rails shall be grouted in cases in which the rails rest on a concrete beam. A suitable gap between the rails and the beam shall be provided for application of the grout. The grout shall be applied strictly in accordance with the manufacturer's instructions. The grout shall be neatly finished with a 45º chamfer. The Engineer shall be notified prior to application of the grout.

In the alignment of equipment or structures, the use of multiple shims will not be permitted.
Shimmed feet shall be fully grouted to provide corrosion protection of the shims.

Grouting shall be done using a non-shrink cementitious grout, ABE Duragrout 1000 or equivalent, to the approval of the Engineer and in accordance with the manufacturer's instructions.

Corrosion Protection

The Contractor shall arrange for the fabrication of the crane to be inspected by the Engineer at the fabricator's premises prior to preparation for corrosion protection.

The crane beam and end carriages shall be hot-metal zinc-sprayed, sealed and coated in accordance with the clause "Corrosion Protection: Metal Coatings". Smaller items, such as cable brackets and protective covers, shall be hot-dip galvanized.

The crane rails shall be hot-dip galvanized after all fabrication work is complete.

Maintenance Platform and Ladder

Where specified in the Detailed Mechanical Specification, a maintenance platform for two people shall be provided along the length of the crane beam.

The crane beam structure shall incorporate welded lugs onto which the platform shall be bolted; i.e. the platform shall be removable and shall not be welded to the crane beam. The complete platform and all guard-railing shall be hot-dip galvanised after fabrication. The platform floor shall have a minimum width of 500 mm.

Guard rails shall be provided on the maintenance platform and shall comply with the clause "Guard Railing".

Where specified in the Detailed Mechanical Specification, a hot-dip galvanised fixed steel ladder shall be provided at a suitable position within the building for accessing the platform on the crane. This shall comply with Clause "Permanent Ladders and Stairs".

2.8.1.4 Hoists

In addition to the general requirements for lifting equipment, hoists shall comply with the following:

i) Hoists shall be provided with an overload prevention device; e.g. a clutch which slips upon overloading. Powered hoists shall comply in all applicable respects with Driven Machinery Regulation 18 of the Occupational Health and Safety Act.

ii) Powered hoists shall hold the load stationary upon power failure.

iii) The bottom hook shall swivel on a ball or roller bearing through 360º and the bearing shall have a protective skirt. The hook shall be fitted with a safety latch.

iv) Lifting chain is preferred, but corrosion-protected steel wire rope is acceptable.

v) Chain boxes shall be provided for holding unloaded lengths of lifting chain.

vi) Wire rope hoists shall comply with the following:

vii) Drum diameter shall be at least 25 times the wire rope diameter.

viii) Drums shall have no more than three layers of wire rope when fully wound up.

ix) Drums shall have no fewer than three full turns of wire rope remaining when the hook is at the lowest design level.

2.8.1.5 Hoist Trolleys

In addition to the general requirements for lifting equipment, hoist trolleys shall comply with the following:

x) Hoist trolleys shall be designed so that the trolley will remain on the support beam if a wheel falls off or a wheel axle fails.

2.8.1.6 Crawl Beams

In addition to the general requirements for lifting equipment, crawl beams shall comply with the following:

xi) Crawl beams shall be fabricated from standard I-Sections or standard H-Sections.

xii) Crawl beams shall be hot-dip galvanised after all fabrication is complete. If the zinc coating is removed or damaged by drilling or welding or any other activity, the complete beam shall have the zinc removed by abrasive blasting and it shall be returned to the galvanisers for hot-dip galvanising.

xiii) Crawl beams anchored to concrete shall be secured using grade 316 SS, or better, anchor bolts. The anchor bolts shall, preferably, be through-bolted. If through bolting is not feasible and chemical anchor is used, every anchor shall be tested to the design load for the anchor prior to installation of the beam.

xiv) Mechanical expanding anchors are not acceptable for anchoring crawl beams.

xv) Crawl beams fastened to steel support structures shall be secured using hot-dip galvanised fasteners.

2.8.1.7 Davits

In addition to the general requirements for lifting equipment, davits shall comply with the following:

i) Davits shall be column mounted with swivelling booms and shall be designed to suit the application. Where specified in the Detailed Mechanical Specification, each davit shall be provided with a winch rigidly fixed to the davit at a convenient height and position.

ii) The davit shall be designed for a SWL at least 50 % above the load requirements of the equipment installation.

iii) Guide pulleys shall be provided to suit the arrangement. These pulleys shall be machined with a groove having a radius 5 % to 7,5 % greater than the rope radius and with a flare angle of 52º. The pulley effective diameter shall be not less than 25 times the wire rope diameter. The groove depth shall be twice the rope diameter or greater.

iv) The davit shall either be manufactured of grade 316L SS, or better, or of carbon steel, hot-dip galvanized and painted. All fasteners, pins, shafts, shackles, hooks, etc., shall be of 316 SS, or better. Guide pulleys and shafts shall be made of 316 SS, or better, or other approved corrosion resistant material, and shall use suitable non-metallic bearings which do not require lubrication.

v) The swivelling arrangement shall be properly designed for easy operation, shall be accurately fitted and shall not be subject to corrosion problems. Bushes made of nylon, "Vesconite" or other suitable non-metallic material shall be used and any metallic rubbing mating face shall be of 316 stainless steel.

vi) Operating cross bars, locking arrangements, fixing arrangements, etc., shall not represent a hazard to passers-by. If necessary, operating levers shall be hinged so that they can be swung out of the way when not in use.

2.8.1.8 Hand Cranked Winches

In addition to the general requirements for lifting equipment, hand cranked winches shall comply with the following:

i) Hand cranked winches shall be rated for a SWL of at least 50 % in excess of the expected working load. All gears, clutches, etc., shall be enclosed in a robust cast iron, cast steel or fabricated stainless steel casing which shall be grease filled and sealed against ingress of dirt and moisture. The winch shall be designed to hold the load stationary when the hand crank is released during raising and lowering. In addition, a locking arrangement to lock the position of the load at any point shall be provided.

ii) The force required to operate the winch at its maximum rated load shall not exceed 130 Newtons.

iii) The wire rope shall be of stainless steel. The wire rope shall be long enough to reach the lowest required position and still have at least 3 turns remaining on the drum. The drum size shall easily store the full rope length. The drum shall have a diameter of at least 25 times the diameter of the wire rope.

iv) The support brackets, all exposed fasteners, shafts, handles, pins, etc., shall be of 316 SS, or better, and the casing shall be hot-dip galvanized or hot-metal zinc-sprayed (to a thickness of 150 µm) and then painted.

2.8.2 Scope

This section covers the crawl beam and associated block and tackle to be supplied and installed for the pump room.

2.8.3 General Description

The lifting equipment shall be designed to suit the building dimensions, lifting duty and functional requirements as appropriate for the equipment supplied.

2.8.4 Equipment Data and Duties

The tendered rate shall include the complete design, provision of drawings for approval by the Engineer, supply, installation, testing, commissioning and certificate for the following Lifting Equipment:

v) The crawl beam and manual block and tackle in the pump room. The safe working load (SWL) shall be the weight of heaviest piece of equipment in the room + 50%;

vi) The length of the crawl beam shall be 5300mm. The lift height shall be 3300mm.

2.9 HEATING VENTILATION AND AIR CONDITIONING

2.9.1 General

2.9.1.1 Ventilation Systems

Design

Performance requirements to be achieved by the Contractor's design are specified in the Detailed Mechanical Specification.

Resistance to flow for all ductwork, pipework and associated equipment shall be calculated by the Contractor prior to equipment selection. At least 250 Pa shall be allowed for resistance losses in filters unless the Contractor can confirm a lower figure. Reasonable modification to ductwork and pipework during installation shall be provided for in the design; i.e. a suitable safety factor shall be incorporated in the design.

Fans

Direct-drive, axial-flow fans shall incorporate manually adjustable pitch, cast aluminium, aerofoil section blades, clamped in split, metallic hubs. Terminal boxes shall be mounted on the fan unit. Fan casings shall cover the overall length of the fan and motor assembly or shall feature a plate mount which incorporates a bell mouth inlet. Suspended fans shall be restrained to prevent excessive torsional and axial movement during start-up.

Axial flow fans installed in corrosive flows shall be either belt-driven or shall have their motors protected by bifurcated airstreams.

Centrifugal fans shall be constructed of galvanized sheet steel with spun steel inlet cones and machined shafting supported on rolling bearings mounted in sealed bearing housings provided with grease nipples. The open type bearing units with exposed "lubricated for life" bearings will not be acceptable. Fans shall be mounted on steel channel base frames sized to accommodate drive motors.

Fan motors shall be protected to IP 55 or higher. Fans and motors shall preferably have a nominal speed of 1 500 rpm or lower and motors shall have a nominal voltage of 400 Volts.

Fans shall be dynamically balanced to ISO 1940, grade G6,3. Fans shall be flexibly connected to ducting.

Fan/motor housings shall, as a minimum, be provided with rubber mountings. Where flexible mounting is specified, fans shall be flexibly supported off the structure using spring or rubber-in-shear mountings having a minimum static deflection of 20 mm. Suction and discharge areas shall be effectively guarded with hot-dip galvanized (or better) wire screens of 12 mm maximum mesh and 1,6 mm minimum gauge. Belt drives shall be accurately aligned axially and angularly and shall be to the Engineer's approval. Guarding shall totally enclose drives, shall be rigidly mounted off base plates and shall be to the Engineer's approval.

Drive motors shall comply generally with the clause 0.

Ducting and Sheet Metalwork

All ducting for air conditioning and ventilation purposes shall be manufactured in accordance with SANS 1238.

Volume control dampers shall be installed where required or where called for in the Detailed Mechanical Specification and shall be of the opposed blade type.

Unless otherwise specified, materials used in the fabrication of air conditioning and ventilation ductwork shall be of hot-dip galvanized, low carbon steel and sheet steel material thicknesses shall be in accordance with SANS 1238.

Flexible connections between ducting and moving equipment shall be by means of approved coated fabric collars with sewn and cemented seams. Flexible collars shall have sufficient free movement to take up the deflection of the connected moving equipment and shall not be used as a means of accommodating misalignment. When installed, collars shall not restrict the free area of the ducting and particular care shall be taken to avoid mounting flexible collars at fan intakes and discharges.

Take off sockets shall be provided where grilles or louvres are mounted in distribution ducting. Sockets shall be long enough to ensure that no part of the grille or its associated control mechanism projects into the duct cross-section. All such duct-mounted grilles shall be provided with opposed-blade, volume control dampers or flap-type volume controls with straightening blades.

Rectangular ducting shall be supported on trapeze type hangers constructed from hot-dip galvanized, low carbon steel angle with Ø10 stainless steel hanger rods. Rod diameter shall be not less than 10 mm and support spacing shall be less than 2 000 mm.

Circular ducting shall be supported in hoops constructed from 40 mm X 5 mm hot-dip galvanized low carbon steel flat bar suspended from Ø 10 mm stainless steel rod at 3 000 mm maximum centres.

Where ductwork penetrates brickwork, a wrot timber frame shall be built in to locate and mount the ductwork or air terminal as the case may be.

Where ductwork penetrates concrete slabs or walls, flanges shall be provided on one side to stabilize the duct and weak grout or fire stopping shall be applied to the spaces between the ducting and the structure to effectively seal the clearance. Where ducting penetrates between areas having differing fire risk or mandatory fire separation, fire dampers to the latest amendment of SANS 193 shall be installed to the Engineer's approval.

Filters

Filter cells shall be mounted in proprietary frames and clip-fixed to achieve zero discernible by-pass. Slide frame mounted filters shall have wing nut fixed airtight cover plates.

Filter banks shall have a differential manometer connected across them. Manometers shall be correctly set up and levelled and shall be provided with red gauge oil of the correct specific gravity.

The filter frame shall be fabricated from hot-dip galvanised steel (minimum thickness of 0,5 mm) unless otherwise specified in the Detailed Mechanical Specification.

Flow speed through the filter opening shall be not greater than 2 m/s.

Sound Attenuators

Circular attenuators shall be directly connected to axial flow fan flanges. Where diameters differ by more than 20 mm, hot-dip galvanized low carbon steel connecting cones shall be bolted between the fan and the attenuator to adapt the respective diameters. Attenuators containing an acoustic pod shall have leading and trailing fairings in moulded grp or spun hot-dip galvanized steel. Pods shall be securely and concentrically fitted in the casings to the Engineer's approval.

Splitter attenuators shall be fabricated of galvanized sheet steel with mating flanges. Splitters shall comprise acoustic lining material mounted on galvanized sheet steel and shall be securely supported within the attenuator casing. Leading and trailing ends of splitters shall have fairings in moulded grp or hot-dip galvanized steel sheet.

Attenuators shall be constructed to achieve the overall acoustic performance specified. Acoustic infill material shall be "Eurolon" by Donkin or equivalent. Where air passageway velocities exceed 20 m/s, the infill material shall be supported by pre-galvanised perforated sheet steel having a thickness of at least 0,8 mm.

Where attenuators are to be used in grease or oil-laden atmospheres or where called for in the Detailed Mechanical Specification, a polyester membrane shall be interposed between the infill material and the perforated sheet.

Attenuators shall not impose a resistance of more than 50 Pa at rated air-flow.

External surfaces of the attenuators shall be painted as for the general ductwork.

Equipment Bases for Equipment in Acoustically Sensitive Areas

The Detailed Mechanical Specification specifies whether the ventilation equipment system design must comply with the requirements of this Clause.

Inertia bases for centrifugal fans, chillers, refrigerant compressors, air cooled condensers, air compressors, pumpsets, motors and the like shall consist of reinforced concrete cast into sheet metal formers and shall be at least 150 mm deep.

Bases shall be reinforced with, at least, ⍰13 mm reinforcing bars located at 150 mm centres each way.

The mass ratio between bases and equipment shall be at least 1:1 for fans and 1,5:1 for pumps. Concrete bases for pumpsets shall be large enough to support pipes and fittings between the pumps and flexible connections and shall also be generally large enough to accommodate the motors and driven equipment. Equipment shall be bolted onto concrete inertia bases.

Structural steel bases shall be provided for cooling towers and evaporative condensers.

Spring isolators shall be installed between concrete inertia bases and floor plinths and between cooling towers or evaporative condensers and floor plinths. Either free standing stable spring units or caged spring units with snubbers may be used. Spring isolators shall be installed with levelling bolts and shall incorporate 6 mm thick ribbed neoprene acoustic pads bonded to the base. Spring diameters shall be large enough to prevent excessive rocking of equipment during start-up as well as normal operation.

Isolators shall be chosen to give a static deflection corresponding to a ratio of 3:1 of the lowest disturbing frequency to the natural frequency of the mounting.

Bases and spring isolators shall be arranged to give a clearance of approximately 25 mm between the underside of the bases and floor plinths.

Floor plinths shall be provided for all equipment bases. Plinths shall be large enough to accommodate the concrete inertia bases and spring isolators. Floor plinths shall also be provided under items of equipment, such as cooling towers, air plena etc., which do not require concrete inertia bases. Plinths under the air plena shall be at least 100 mm higher than the finished floor level.

Equipment Noise Control

Refer to clause 0.

Machine Vibration

Refer to clause 0.

2.9.2 Scope

This section covers the HVAC equipment for the Filter Feed Pump Station.

2.9.3 General Description

Filtered inlet air shall be supplied to the bottom of the equipment rooms via new forced ventilation fans and ducting arrangements. The forced air introduced shall allow for adequate cross-flow throughout the entire room. The introduced air in the building shall escape through outlet louvres at a high level on the opposite side of the room.

The ventilation systems for the buildings listed above shall be designed to adequately ventilate the rooms. The ventilation systems shall include the following:

New outlet louvers discharging air at a high level on the outside wall;

New inlet forced ventilation fans, on the opposite wall of the new outlet louvers;

The inlet forced ventilation fan arrangements shall include coarse air filters, which must be easily accessible and removable. A spare set of filters for each system must be provided;

All necessary ducting arrangements for each fan to supply air to the bottom of the building on the opposite side to the outlet louvers;

All necessary sound attenuation on all the forced ventilation fans; The sound attenuation shall reduce the noise level to a maximum of 80 dB(A) @ 1m away, during normal operation, with one unit running;

Each building shall be provided with its own duty/standby inlet ventilation fan arrangement;

Scope to cover the necessary switchgear and electrical considerations required to successfully install, commission and operate the system.

2.9.4 Equipment Data and Duties

New forced ventilation fans will be required for the buildings listed in the table below, to supply air to the bottom of the equipment rooms and force the heat generated to outside and maintain the required air changes. On the suction side of each fan air shall be filtered by a coarse air filter. Air shall be taken into the building with common ducting routed to a low level in the building such that air is introduced at various points and in such a way that the entire room is ventilated. The Tenderer shall size the louvres, fans and ducting such that the above described ventilation requirements are met and submit calculations to this effect.
The face velocity at the outlet louvers located at a high level in the outside wall should equate to a maximum of 2.0 m/s. The louvres shall be weather resistant, sand trap, vermin and bird proof louvres.

Ventilation				
Room	No. of air changes (/hr)	Size of Room (m^3)	Forced ventilation requirement (m^3/hr)	Outlet Louvres requirement (m^3/hr)
Filter Feed Pumpstation	10	200	2000	2000

2.9.5 Electrical Motors

Refer to Detailed Mechanical Specification:0 2.5 Electric **Motors**. The fan motor speed shall not exceed 1 500 rpm.

2.9.6 Control Philosophy

The ventilation system shall operate continuously.

The design of the ventilation system, including drawings, functional specification, control panel layout, circuit diagrams and protection systems, shall be submitted to the Engineer for approval.

2.10 CORROSION PROTECTION AND PAINT

2.10.1 Corrosion Protection: Application and Control

2.10.1.1 Painting Contractor

Surface preparation and coating application shall be carried out by suitably trained and experienced industrial painting contractors who are fully equipped and staffed to do such work in their own covered premises strictly in accordance with the paint manufacturer's recommendations. Before proceeding with the corrosion protection coatings, the Contractor shall submit the name of the painting sub-contractor and the proposed works supervisor for approval by the Engineer.

2.10.1.2 Site Work

Surface preparation and coating application shall not be done on Site except for minor repairs, for application of the final aesthetic coat, where specifically called for in the Detailed Mechanical Specification or where permitted by the Engineer in writing.

2.10.1.3 Systems to be Used

Systems

The corrosion protection systems to be used on the plant and equipment will usually be specified in the Detailed Mechanical Specification, but if not, the Contractor shall recommend a suitable system for approval by the Engineer. If doubt exists as to the system or colour to be used, the Engineer's requirements must be ascertained.

Alternative Systems

Alternative systems superior to those specified may be used if approved in writing by the Engineer.

All Items to be Painted

Except where otherwise specified, all metal surfaces shall be painted. This includes hot-dip galvanized items and metal-sprayed coatings. In the latter case the paint shall be in the form of a sealer. Details of approved painting systems to be used are given below.

Grade 316 Stainless Steel

It is not usually necessary to paint 316 stainless steel. If corrosion of 316 stainless steel does occur, and depending on the appearance or extent of the problem, the Engineer may call for pickling, electro-cleaning, painting or replacement of the item at no additional cost. Painting may however be required if contaminated or stained surfaces cannot be properly cleaned or where stitch welding has been approved.

2.10.1.4 Quality Control of Coating Application

Quality Plan and Records

The Contractor shall provide a Quality Plan which shall include all steps in the surface preparation and corrosion protection process plus technical data sheets for all products proposed. Records of compliance with the Quality Plan shall be maintained.

Responsibility and Rectification

The Contractor is responsible for the quality of the work and materials used, irrespective of any quality surveillance that may be carried out by the Engineer.

If unacceptable work is found on Site, the full area associated by the engineer with that unacceptable area shall be redone after the Contractor has submitted a method proposal.

Inspections

The Contractor shall arrange for the coating application on fabricated steelwork to be inspected throughout by the Engineer. The Engineer may approve inspections by an independent competent person (hereinafter called the Inspector) appointed by and at the cost of the Contractor. Inspections shall be adequate to ensure compliance with the Specification and shall be done at the following stages as a minimum:

Coating (Hot-Metal Spray, Paint, etc.)

After fabrication but before surface preparation.
After surface preparation but before application of the first coat.
After application of the final hot-metal sprayed coating or after application of the paint primer or first coat (as applicable).
After the final factory applied paint or sealing coat.

Hot-dip Galvanizing
After fabrication but before hot-dip galvanizing.
After hot-dip galvanizing.

Duplex Protection (Hot-dip Galvanizing and Coating)
After fabrication but before hot-dip galvanizing.
After hot-dip galvanizing but before application of the first coat.
After application of the primer.
After the final Site-applied paint coat.

Witnessing of Inspection

If the coating is to be done in the Cape Peninsula by in inspector other than the Engineer, the Contractor shall, nevertheless, arrange for the Engineer to witness the inspections at the latter's discretion.

Dry Film Thickness

The dry film thickness of any coat or coating system shall be determined in accordance with SANS 2808. The test method defines that the instrument is to be calibrated on a substrate that represents the surface to be coated.

Inspection Report

A written report of the inspections, prepared by the Inspector and signed by both the Inspector and the Contractor, shall be submitted for appraisal by the Engineer before delivery of the equipment to Site.

Inspector Qualifications

Inspectors appointed by the Contractor shall hold an appropriate qualification from one of the following:

i) Corrosion Institute of Southern Africa.

ii) South African Institute of Welding.

iii) South African Institute for Non-Destructive Testing.

iv) South African Qualification and Certification Committee.

Identification of Items

Every item to be coated shall be identified by a welded or hard-stamped code. Records shall be maintained for each item.

2.10.2 Corrosion Protection: Surface Preparation

2.10.2.1 Imperfections

Welding shall be free of blowholes and all welding flux removed. All weld spatter, sharp edges and other imperfections shall be removed prior to abrasive blasting. Prior to painting, weld beads with a surface irregularity exceeding 3 mm or with sharp crests having a radius under 2 mm shall be ground. (Weld grinding must not, however, be performed on stainless steel). Areas to be painted shall be free of crevices.

2.10.2.2 Edges

Edges shall be rounded to a radius of at least 2 mm.

2.10.2.3 Cleanliness

The provision of acceptable cleanliness entails not only the removal of existing mill scale, coatings and/or corrosion product, but also the removal of surface contaminants such as oil, grease and soluble salts.

Water soluble salts present on the steel before application of the primer shall not exceed 10 µg/cm^2.

2.10.2.4 Abrasive Blasting

Before coating, all new steel surfaces shall be abrasive blast cleaned in accordance with Section 4.3 of SANS 10064 to a preparation grade of ISO-Sa3 in accordance with ISO 8501. The blast profile, measured in accordance with SANS 5772 (dial gauge), shall be in the range of 50 to 75 µm. The abrasive shall comply with SANS 10064 and shall be free from all traces of oil, grease, foreign matter and corrosive contaminants

such as chlorides, etc. The blasted surface shall be cleaned and degreased as required. The prepared surface shall be given the first coat of the painting system within 4 hours after blasting.

In instances where stainless steel and 3CR12 are to be painted, the surface shall be suitably abrasive blasted prior to primer application.

2.10.2.5 Between Coats

Between coats or with previously painted surfaces in good condition, all traces of oils, greases,
soluble salts and corrosive air borne contaminants shall be thoroughly washed from the surface to be painted using a detergent type cleaning agent, rinsed and dried. The previous coat shall then immediately be lightly sanded or otherwise prepared as recommended by the paint manufacturer, wiped clean, dried and painted. Solvents are not acceptable as a surface cleaning agent.

2.10.2.6 Hot-Dip Galvanized Surfaces

Hot-dip galvanized surfaces to be painted shall not be passivated and shall be free from white rust and shall be leaned with an approved water based galvanizing cleaner using non-metallic abrasive pads until a "water break free" surface is obtained. The surface shall then be thoroughly rinsed with clean potable water to remove all residues and dried immediately prior to painting. Where necessary to obtain adhesion a sweep blast of the surface shall be done after cleaning.

2.10.3 Corrosion Protection: Metal Coatings And Duplex Coatings

2.10.3.1 General

Fabrication of items to be protected by metal coatings shall be in accordance with SANS 14713.

2.10.3.2 Hot-Dip Galvanizing

General

Hot-dip galvanizing shall be done in accordance with SANS 121 and the following shall apply:

i) Coatings shall be to the thicknesses detailed in the Standard.

ii) Hot-dip galvanized material which is to remain unpainted shall be passivated as specified in SANS 121. Items to be painted after hot-dip galvanizing shall be air dried and not passivated.

iii) Hot-dip galvanized material shall be substantially free from white rust when it is erected on site. Stacking and storing shall at all times be done in a manner to prevent white rust forming.

iv) Damage to hot-dip galvanizing caused by welding, grinding, etc. is not acceptable. Repair to hot-dip galvanizing damaged by handling or transport shall be done by cleaning the area and applying 3 coats of a zinc rich primer giving a dry film thickness of at least 100 µm and containing at least 94 % zinc in the dried film. If the Engineer considers that damage is excessive, such items shall be replaced by the Contractor without cost to the Employer.

v) Welding after hot-dip galvanizing is not acceptable.

vi) The Contractor shall supply a galvanizer's guarantee or test certificate prior to installation.

Duplex Systems

Preparation and application of organic coatings on hot-dip galvanizing shall be done in accordance with the Hot Dip Galvanizers Association Southern Africa’s Code of Practice for Surface Preparation and Application of Organic Coatings.

The duplex system shall be as follows:

i) Hot-dip galvanizing; without passivation of the zinc coating.

ii) Application of one coat of an epoxy primer (two part; for hot-dip galvanised surfaces) with a dft of 75 µm.

iii) Polyurethane enamel top coat (two part) with a dft of 50 µm; done on Site after suitable repair to the primer.

Acceptable coating products are specified elsewhere.

2.10.3.3 Hot-Metal Sprayed Coatings

General

Fabrication and surface preparation of items to be protected by hot-metal spray shall comply with the requirements specified in this Standard Specification for Mechanical Works (including General Works).

Hot-metal sprayed coatings shall be in accordance with SANS 2063 and shall comply with the following:

i) The minimum coating thickness for both aluminium and zinc shall be 150 µm. Greater thicknesses may be specified in the Detailed Mechanical Specification.

ii) The thickness shall be checked on every surface plane at points not more than 300 mm apart for small articles and 500 mm for large articles. Angles shall be checked along all 4 surfaces, channels along all 6 surfaces, pipes in 4 planes. The minus tolerance on thickness in isolated areas shall also not exceed –10 % and such low areas shall not be larger than 50 mm in diameter.

iii) The time between surface preparation and coating shall be shortened from 4 hours to 2 hours at any application area closer than 10 km from the coast.

iv) Unless otherwise specified, all hot-metal coatings shall be sealed and coated immediately after hot-metal spraying. The system shall consist of a low viscosity sealant, which is applied until absorption is complete, followed by a suitable coating system.

The sealant systems outlined below are acceptable (where appropriate for the particular application).

System 1 (for immersion applications)

Application of an epoxy zinc sealer to a dft of 60 µm (Sigmacover 522, or equivalent).

Application of two coats of epoxy pipe coating to a dft (per coat) of 125 µm; (Sigmaguard 720, or equivalent).

System 2 (for non-immersion applications)

Application of a two part epoxy primer to a dry film thickness of 40 µm; (Intergard 269, Carboline Rustbond Penetrating Sealer, or equivalent).

Application of one intermediate coat chemical resistant vinyl copolymer to a minimum dry film thickness of 70 µm (Carboline Polyclad 938 HB, or equivalent).

Application of one coat of vinyl copolymer chemical resistant enamel to a minimum dry film thickness of 40 µm (Carboline Polyclad 938-2, or equivalent).

System 3 (suitable for crane beams, gantries, etc.)

Application of one coat of a two-part epoxy primer to a dry film thickness of 40 µm; (Carboline Rustbond Penetrating Sealer, Intergard 269, or equivalent).

Application of two coats of a two-part polyurethane enamel (two part) to a minimum combined dry film thickness of 70 µm.

System 4

Application of micaceous oxide pigmented polyamide cured epoxy to achieve a dry film thickness of 60-80 µm; (Sigmacover 522, or equivalent).
One coat of solvent borne modified acrylic coating to achieve a dry film thickness of 70 µm; (Sigma Topacryl coating, or equivalent).

One coat of solvent borne modified acrylic finish to a dry film thickness of 30-45 µm; (Sigma Topacryl finish, or equivalent).

2.10.4 Paint

2.10.4.1 Paint Quality

Paint shall be of best quality, of approved manufacture and brand and comply with the requirements of the relevant SANS (South African National Standards) or BS specifications.

Compatibility

All materials in a paint system shall be purchased from one paint manufacturer.

Packaging

All coating materials shall be delivered in the manufacturer's original, sealed containers of maximum 25 litre capacity, clearly marked with the following:

i) Manufacturer's name.

ii) Product Brand and Reference Number.

iii) Batch Number, which may incorporate the date of manufacture.

iv) Date of manufacture, unless already incorporated in the batch number.

v) Abbreviated instructions for storage and use of the material, which shall include mixing ratios of components for multi-component materials, minimum temperature of application, method of application, and minimum and maximum overcoating times where applicable.

Confirmation of Suitability

Contractors shall obtain confirmation from their paint suppliers that, when using their paints, the systems specified are technically correct and suitable for the application and the material being coated.

2.10.4.2 Paint Application

Surface Preparation

All surfaces shall be properly prepared as specified in Clause "Corrosion Protection: Surface Preparation".

Coats shall be clean and free from dust, oil and moisture before overcoating. The primary method for determination of oil and grease contamination of surfaces shall be visual inspection. Any surface that exhibits obvious signs of oil and grease, as well as variations in surface rusting and flash rusting, shall be regarded as having oil or grease contamination. All surfaces which have been machined or have had holes drilled shall be regarded as having oil and grease contamination.

Environmental Conditions

Paint shall not be applied if:

i) the conditions are windy or dusty.

ii) the surface temperature is less than 10 ºC.

iii) the surface temperature is less than 3 ºC above dewpoint.

iv) the surface temperature is above 35 ºC.

v) the conditions are contrary to the manufacturer’s recommendations.

vi) the relative humidity is 85% or above (the determination of humidity may be made using moisture sensitive hair-type gauges, electronic gauges or sling psychrometers (whirling hygrometers) having a resolution of at least 1% humidity. Electronic gauges shall have calibration certification not more than 6 months old. Moisture sensitive hair-type and analogue gauges shall have a calibration certificate not more than 1 month old. The accuracy of thermometer used in sling psychrometers shall be tested by placing at least 4 thermometers displaying temperatures within half a degree Centigrade of a mean shall be used).

Mixing

Coating materials shall be mixed thoroughly by a power stirrer.

In the case of two-pack materials, each component shall be thoroughly stirred separately. The

two components shall then be mixed together in the proportions supplied by the manufacturer until the mixture is completely homogeneous. The use of part of the contents is not acceptable.
In the case of solvent based epoxy materials, the mixed material shall be allowed to stand for the induction period recommended by the material manufacturer.

Painting

Paints shall be applied strictly in accordance with the manufacturer's instructions by tradesmen skilled in this class of work. Thinning of paint shall only be allowed for spray application and the manufacturer's recommended thinners shall be used.

Stripe Coats

All edges and welds shall be provided with at least one stripe coat. This coat shall, preferably, be the same as the primer but can be the same as the intermediate coat.

Coating of Hidden Areas

Areas which will be inaccessible after erection and surfaces resting on floors shall receive the full paint system prior to erection.

Surfaces in Contact

Mating or contact surfaces shall be treated with one of the following systems, the system being chosen to suit the application:

vii) Surfaces shall be prepared and primed and brought together while the paint is still wet; or,

viii) Each surface shall be provided with one coat of inorganic zinc silicate; or,

ix) Surfaces shall be provided with a mastic or sealant; or,

x) Surfaces shall be provided with insertion rubber or other gasket material.

Crevices

Crevices will not be permitted. Where unavoidable crevices are accepted by the Engineer, such crevices shall be sealed with either a coal tar product which can be applied at thicknesses of up to 1 000 µm such as Carboline Bitumastic 50 or equivalent; or a two part solvent free epoxy which can be applied at thicknesses of up to 600 µm such as Sigmaline 523 or equivalent.

Items encased in Concrete

Metal to be encased in concrete shall be painted externally up to 30 mm inside the concrete section, leaving the remainder bare so as to facilitate bonding with the concrete.

Protection of Machined Surfaces

Where painting of machined surfaces is not possible or advisable, these surfaces shall be coated with an approved proprietary anti-corrosion compound giving 12 months protection under operating conditions. Shaft ends and machined mating or mounting surfaces or pads shall be so coated and shall not be painted.

Coating Thickness

The dry film thickness shall be measured using a non-destructive thickness testing machine and shall comply with the Specification. 90 % of all thicknesses measured shall comply with the minimum requirements of the Specification. Up to 10 % of all readings may be below the specified minimum thickness, but may not be less than 80 % of the specified minimum thickness.

Repair

Painted areas damaged during transportation, erection or any means whatever shall be repaired as follows - Rusted spots shall be removed and cleaned by means of a wire brush or emery paper to a bright metal finish and the surrounding paint which is still intact shall be feathered for a distance of 50 mm beyond the damaged area. Spot priming and repair shall consist of all the coats previously applied and shall overlap the undamaged area.

Protection on Site

Proper and adequate use of cover sheets and other means shall be made to protect the existing paintwork from damage and from metal dust and sparks when welding, grinding, and wire brushing on site. Similarly, effective steps shall be taken to prevent spillage or splashing or other damage to floors, walls and equipment when painting on site and any damage or mess caused shall be corrected at the Contractor's cost.

Final Coat

A continuous, smooth finish with a uniform colour is required. The final external coat/s shall, where applicable, be applied on Site after installation.

2.10.5 Final Colour

Colours shall comply with the National Colour Standard, SANS 1091.

The final colour marking shall be in accordance with SANS 10140.

Where SANS 10140 does not specify a requirement, the colour marking shall comply with the following:

PIPEWORK				
Contents of Pipe	Basic Colour	Colour of Indicator		
		1 Band	2 Bands	3 Bands
Air				
Compressed, Power	Arctic Blue (F28)			
Aeration	Arctic Blue (F28)	Canary Yellow (C61)		
Instrument	Arctic Blue (F28)	Salmon Pink (A40)		
Vacuum	Arctic Blue (F28)	Primrose (C67)		
Lime Transfer	Arctic Blue (F28)	Crimson (A03)		
Backwash	Arctic Blue (F28)	Verdigris Green (E22)		

PIPEWORK				
Contents of Pipe	Basic Colour	Colour of Indicator		
		1 Band	2 Bands	3 Bands
Chemicals				
Aluminium Sulphate	Jacaranda (F18)	Verdigris Green (E22)		
Sodium Aluminate	Jacaranda (F18)	Crimson (A03)		
Ferric Sulphate	Jacaranda (F18)	Canary Yellow (C61)		
Lime (dry powder)	Jacaranda (F18)	Salmon Pink (A40)		
Activated Carbon	Jacaranda (F18)	Light Stone (C37)		
Polyelectrolyte	Jacaranda (F18)	Cloud White (G80)		

PIPEWORK				
Contents of Pipe	Basic Colour	Colour of Indicator		
		1 Band	2 Bands	3 Bands
GASSES (other than air); liquefied or gaseous				
Butane, Propane	Light Stone (C37)			
Ammonia Light	Stone (C37)	Ultramarine (F09)		

PIPEWORK				
Contents of Pipe	Basic Colour	Colour of Indicator		
		1 Band	2 Bands	3 Bands
GASSES (other than air); liquefied or gaseous				
Blast furnace	Light Stone (C37)	Crimson (A03)		
Carbon Dioxide	Light Stone (C37)	Light Brunswick Green (H07)		
Coke Oven	Light Stone (C37)	Light Grey (G29)		
Polyelectrolyte	Light Stone (C37)	Cloud White (G80)		
Producer	Light Stone (C37)	Verdigris Green (E22)		
Chlorine, Hypochlorite	Light Stone (C37)	Canary Yellow (C61)		

PIPEWORK				
Contents of Pipe	Basic Colour	Colour of Indicator		
		1 Band	2 Bands	3 Bands
Water				
Cold Drinkable	Brilliant Green (H10)	Cornflower (F29)		
Hot Drinkable	Brilliant Green (H10)	Crimson (A03)	Cornflower (F29)	
Boiler Feed (Distilled)	Brilliant Green (H10)	Crimson (A03)	Cloud White (G80)	Crimson (A03)
Boiler Feed (De-mineralised)	Brilliant Green (H10)	Cloud White (G80)		
Industrial, Raw	Brilliant Green (H10)	Golden Yellow (B49)		
Reclaimed	Brilliant Green (H10)	Jacaranda (F18)		
Backwash	Brilliant Green (H10)	Light Stone (C37)		
De-sludge	Brilliant Green (H10)	Canary Yellow (C61)		
Stove Circulating	Brilliant Green (H10)	Salmon Pink (A40)		
Hydraulic Power	Brilliant Green (H10)	Terra Cotta (A10)		
Final Treated Effluent	Aquamarine (E67)			
Interchange, Stage	Drakensberg Green (H36)			
Raw Sewage	Olive Green (H05)			
Sea Water	Light Brunswick Green (H07)			
Primary Sludge	Dark Brown (B03)			
Waste Activated Sludge	Light Brown (B15)			
Digested Sludge	Light Brown (B15)	Light Olive Green (H21)		

PIPEWORK				
Contents of Pipe	Basic Colour	Colour of Indicator		
		1 Band	2 Bands	3 Bands
Water				
Pasteurised Sludge	Light Brown (B15)	Cloud White (G80)		

PIPEWORK				
Contents of Pipe	Basic Colour	Colour of Indicator		
		1 Band	2 Bands	3 Bands
Oil				
Diesel Fuel	Golden Brown (B13)	Cloud White (G80)		
Hydraulic Power	Golden Brown (B13)	Salmon Pink (A40)		
Lubricating	Golden Brown (B13)	Verdigris Green (E22)		
Transformer	Golden Brown (B13)	Crimson (A03)		
Paraffin	Golden Brown (B13)	Arctic Blue (F28)		

Plant and Equipment	
Equipment	Colour Code
Fire Fighting	
Equipment and Pipework	Signal Red (A11)
Electrical	
Distribution Boards, Switch-Gear, Terminal Boxes and Conduits	Light Orange (B26)
Emergency Stop	Signal Red (A11)
Machine Guards	
Inside	Light Orange (B26)
Outside	Colour of Machine
Protruding Shafts, Exposed Gear Wheels and Rotating Parts	Light Orange (B26)
Handrails	
Horizontal Rails and Chains	Golden Yellow (B49)
Stanchions	Black
Protrusion, Sides of Ramps	Black and Yellow Diagonal Stripes
General	
Scour Pipes	Deep Buff (B24)
Valves	Basic colour of pipeline
Workshop Floor Demarcation	
Demarcation Lines	Golden Yellow (B49)
Working Areas	Pastel Grey (G54)
No Parking, No Storage	Golden Yellow (B49)
Aisles and Walkways	Brilliant Green (H10)
Storage Area Terracotta (A10)	Terracotta (A10)
Urethane based paint is to be used for concrete surfaces Traffic paint is to be used for tarred surfaces	

2.10.6 Acceptable Materials and Suppliers

The table below lists acceptable materials and suppliers. In all cases, other equivalent materials and suppliers are acceptable.

GENERIC	MATERIAL/SUPPLIER
Hot-Dip Galvanizing	Hot-dip galvanisers shall hold the certification mark for SANS 121.
Powder Coating	Plascon epoxy/polyester powder : CEP series, Sigmalining FBE 27.
Universal Undercoat	Sigmarine 40, Carboline GP-64 Undercoat, Plascon Plasconamel 189 Undercoat.
High-Gloss Alkyd Enamel	Carboline AD-51 Finish, Plasconamel 1000 Finish, Sigmarine 49.
HB Epoxy Primer : Two Part	Plascon Plascotuff HB Epoxy MLE series, Sigmazinc 109HS, Carboline 193 Primer.
Epoxy Primer : Two Part (for hot-dip galvanized surfaces)	International Interguard 269, Sigmacover 280.
Polyamine/Amide Cured Epoxy Sealer/Coating: Two Part	Carboline Rustbond Penetrating Sealer, Plascon Plascoguard Copon EA3 Primer, Sigmacover 522.
Epoxy Intermediate Coat	Sigmacover 456, Carboline 190 HB, Plascon Plascosafe 18 Primer, Sigmacover 435.
Low Solvent, High Solids, Polyamine/Amide Cured Epoxy: Two Part	Plascon Plascoguard Copon KSIR88, Sigmaguard 720 Ameron Amercoat 385, Carboline 891.
Polyamine/amide Cured Coal Tar Epoxy : Two Part	Sigmacover 300, Carbomastic 200, Ameron Amercoat 78HBB.
Solvent Free Epoxy repair coating	Plascon Plascoguard Copon Hycote 151, Sigmaguard 575.
Aluminium Filled Epoxy: Two Part	Ameron Amerlock 400 AL, Carbomastic 15, Sigmacover 630.
Two Part Solvent Free Epoxy For Submerged Applications	Sigmarite Submarine Coating, Carboline 1208, InterZone 954, Jotamastic 87.
Zinc Phosphate Primer	Carboline GP-18 Primer, Plascon Plascoprime 183 HB, Bildphos M10 Primer.
Inorganic Zinc Silicate	Plascon Plascozinc 233, Sigmazinc 160, Carboline Carbozinc 11, Ameron Dimetcote 11.
Modified Silicon	Carboline 4631, Plascon Plascotherm Silicone 540 – Aluminium, Sigmatherm 520.
Silicone Acrylic	Plascon Plascotherm Silicon – Acrylic 200 T, Carboline 1248.
Polyurethane Enamel: Two Part	Sigmadur 550, Carboline 134 over polyamine/mide coatings, Carboline 133 HB over zinc coatings, International Interthane 990, Plascon Plascothane Recoatable Enamel CPC Series, for two-coat systems, Plascon Plascothane Recoatable Enamel CPQ Series, for single coat systems.
Glass Flake Resin	Power Blast Vitaglass or equivalent.
Hot-applied Thermoplastic	Rilsan or equivalent.
Thick Coating for Complex Surfaces	Sigmaline 523 or Carboline Bitumastic 50.

2.10.7 Painting Systems

The abbreviation "dft." used in this Specification shall mean dry film thickness given in microns and, except where otherwise specified, is the minimum (not average) thickness permissible.

2.10.7.1 System for Steel in Dry Applications up to 200 ºC

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	Blast steel surface to ISO-Sa3 in accordance with ISO 8501.	
2.	Coat of inorganic zinc silicate.	75
3.	Coat of modified silicon heat resisting coating for 200ºC.	75
		Total = 150µm

Particular care shall be taken to obtain the recommended anchor pattern during abrasive blasting and to achieve the required primer thickness on all surfaces in one coat.
The primer must be factory applied.
The primer shall be tested for full cure before applying the subsequent coat.
An intermediate coat suitable for 200 ºC shall be included between the primer and topcoat if so recommended by the paint manufacturer.
The top coat must cure at ambient temperatures.

2.10.7.2 System for non-immersed Steel in Coastal Atmosphere

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	Blast steel surface to ISO-Sa3 in accordance with ISO 8501.	
2.	Coat of two component zinc epoxy primer.	100
3.	Coat of two component epoxy intermediate.	150
4.	Coat of polyurethane enamel (two part).	50
		Total = 300µm

2.10.7.3 System for Cast Iron Components

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	Blast steel surface to ISO-Sa21/2 in accordance with ISO 8501	
2.	Coat high build epoxy primer	100
3.	Coat polyurethane enamel (two part)	60
		Total = 160µm

2.10.7.4 System for Large Immersed Steel Fabrications

This system is suitable for steel items subject to immersion, semi-immersion and non-immersion such as tanks, pipes, etc.

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	Blast steel surface to ISO-Sa3 in accordance with ISO 8501	
2.	Apply three coats of a low solvent, high solids, polyamine/amide cured, epoxy (two part).	350
		Total = 350µm
The coating shall undergo EID detection over the full surface in accordance with SANS 1217. This test shall be done by an inspector holding an appropriate qualification from either the CISA, the SAIW or the SAQCC. When applied to hot-dip galvanized surfaces, a suitable epoxy primer shall be used after careful surface preparation before applying this system. This system shall be applied by a specialist applicator prior to delivery to site with particular attention to the required interval between coats. The first and third coats shall be a different colour to the second coat.		

2.10.7.5 System for Large Immersed Steel Fabrications (non-chalking surface)

This system has similar applications to the system above, but which also require a non-chalking surface.

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	System for Large Immersed Steel Fabrications	350
2.	One coat of polyurethane enamel (two part)	40
		Total = 390µm

2.10.7.6 System for Large Immersed Steel Fabrications (not requiring decorative finish)

This system is suitable for steel items subject to immersion, semi-immersion and non-immersion such as archimedes screw pumps, large tanks, etc.

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	Blast steel surface to ISO-Sa3 in accordance with ISO 8501	
2.	Coat of polyamine/amide cured coal tar epoxy.	140
3.	Coat of polyamine/amide cured coal tar epoxy.	140
4.	Coat of polyamine/amide cured coal tar epoxy.	140
		Total = 420µm
Each coat shall preferably be of a different colour. Two coats will be acceptable if recommended by the paint manufacturer.		

2.10.7.7 System for Hot-Dip Galvanized Steel (Duplex)

STEP	PREPARATION/COATING METHOD	METHOD Minimum dft (µm)
1.	After hot-dip galvanizing, do not passivate.	
2.	Coat epoxy primer (two part for HDG surfaces)	75
3.	Coat polyurethane enamel (two part)	50
		Total = 125µm

C3.7 ELECTRICAL

PSE – Electrical Specifications

INTRODUCTION

1. SCOPE SUMMARY

This section of the project relates to the low voltage electrical, control, network, telemetry and SCADA components for the new section of plant at the existing Bonnievale WTW.

The project offer pertains to the design, manufacturing and procurement, quality control, transport and rigging, installation, testing, commissioning, system optimisation, trial-period, taking-over and closing-out of a holistic, complete and compliant project of works by the Contractor and associated Sub-Contractors.

This contract will be executed as a Main Contract, with Sub-Contractors where required. The Contractor must liaise closely with their respective work forces/teams associated to the project, for example civil construction and mechanical installation to ensure smooth parallel running and or/interlinking coordination between structural, casting tasks as well as layout requirements and programming of integrations and installations. The Contractor must allow for all costs involved in liaising with the related or Sub-Contracting parties, to convey the requirements or coordination and attend meetings as required during the project, as no additional costs will be allowed for during the contract for such work.

The Electrical components are broken down into the following relevant project specification categories:

- PART 1 : LOW VOLTAGE ELECTRICAL
- PART 2 :CONTROL SYSTEM INTEGRATION
- PART 3 :INSTRUMENTATION
- PART 4 : SCADA AND TELEMETRY

Each project specification part must be read in conjunction with the other disciplines, as the electrical components must function as a whole and fully functional system.

2. REFERENCED STANDARD SPECIFICATIONS

The Electrical, Control and Instrumentation (E,C&I) Project Specifications must be read in conjunction with the following Electrical Standard Specifications:

SSE02	LV and Control	Rev 1
SSE03	Instrumentation and Control Devices	Rev 1
SSE04	Telemetry and SCADA	Rev 2

The Electrical, Control and Instrumentation (EC&I) Project Specifications take precedence over the Electrical Standard Specifications, should there be contradictions. The E,C&I Specifications must also be read in conjunction with the Mechanical Project Specification and Mechanical Standard Specification(s), including all issued drawings, to ensure integration and allowance made for interfaces that may be required for pump, motors and other mechanical equipment.

3. APPLICABLE STANDARDS

All work carried out, including design of plants and equipment supplied, must fully meet and be in compliance with the requirements of the Occupational Health and Safety Act (Act 85 of 1993) and the Construction Regulations (2014) issued in terms of Section 43 of the Act.

In addition, the latest revisions of the following statutory regulations, laws and obligations as pertaining specifically to any and all electrical work applicable to this specific project are applicable:

- The regulations of the local Supply Authority
- The regulations of the Client, being either Governmental, Municipal, Parastatal or Private
- Local fire regulations
- SANS 10400-A: 2010 – The application of the national building regulations, Part A: General principles and requirements

All references to "SABS" specifications shall be read as "SANS" in light of the recent changes by the South African Bureau of Standards. Any reference made to a standards, shall refer to the latest available revision, or sub sequent standard that replaces the referred standard. Where a SANS Standard does not exist or if not applicable, the relevant IEC or BS Standard shall be applicable.

In the event of discrepancy between any of the specifications, regulations and codes of practice, the SANS 10142-1 Code of Practice for Wiring of Premises shall take precedence.

Additionally, the following specifications, whether specifically mentioned, or not, within this document, shall also apply:

SANS 1091	**National colour standards**
SANS 10140	**Identification colour marking**
SANS 156	**Moulded case circuit breakers**
SANS 60269-1	**Low-voltage fuses, Part 1: General**
SANS 60269-4	**Low-voltage fuses, Part 4: Supplementary requirements for fuse-link for the protection of semiconductor devices**
SANS 1507-1	**Electrical cables with extruded solid dielectric insulation for fixed installations (300/500V to 1900/3300V), Part 1: General**
SANS 1973-1	**Low voltage switchgear and controlgear assemblies, Part 1: Type-tested assemblies with stated deviation and a short-circuit withstand strength above 10kA**
SANS 1973-3	**Low voltage switchgear and controlgear assemblies, Part 1: Safety of assemblies with a rated protective short-circuits up to and including 10kA**
SANS 475	**Luminaires for interior lighting, streetlighting and floodlighting – Performance requirements**
SANS 10114-1	**Interior lighting, Part 1: Artificial lighting of interiors**
SANS 10222-5-1-3	**Electrical security installations, Part 5-1-3: CCTV installations - CCTV surveillance systems for use in security applications - Installation, planning and implementation requirements**
SANS 60793-1-1	**Optical fibres, Part 1-1: Measurement methods and test procedures - General and guidance**

SANS 10131	**Above-ground storage tanks for petroleum products**
SANS 780	**Transformer Testing**
SANS 1084-1/2	**Electric Motor Standards**
SANS 10131	**Fuel Tank Design and Construction**
SANS 10198	**Cable Trenching**
SANS 1804	**Induction Motors**
SANS 2001 (collection)	**Construction works**

4. DESIGN DOCUMENTATION AND DRAWINGS

Within the period as stipulated per the contract conditions, after the commencement date, the Contractor must supply the following minimum information for approval before commencing manufacturing:

a) Working or "Shop" drawings of the proposed plant, including all main items of equipment to be installed, as well as all cable and wiring diagrams.

b) MCC layouts and single line diagrams detailing all control metering and indication circuits inclusive of a description of circuit operation

c) Network design and equipment drawings/layouts

d) Selected instrumentation and incorporation into network, MCCs and control philosophy

NOTE:

Drawings and documentation must be neat and clearly legible. Circuit diagrams must be done on a grid system with elements of control equipment referred to applicable (grid) line numbers in a schedule directly below the relevant control device.

5. CONTRACT IMPLEMENTATION

All contract and construction implementation requirements are set out in the general section of this document. This would relate to items such as factory and witness testing, site commissioning, trial and operational period, As-Built documentation and training.

All electrical components must comply in full to these specifications and priced accordingly in the allocated BOQs.

PART 1 : LOW VOLTAGE ELECTRICAL

1. GENERAL SCOPE

This part of the electrical works must be read in conjunction with all other electrical parts, including standard specifications and applicable drawings.

The low voltage electrical scope of works consists of the following main components:

- Existing minisub additions:
    - Integration of new LV supply CB for Filter Feed PS
    - Municipal switching coordination
- New Motor Control Centre (MCC) for:
    - Filter Feed PS with:
        - Various starters and protections for filter feed pumps and associated cooling fans
        - PLC controlled system with local HMI display
        - Uninterruptible power supply (UPS)
        - Remote telemetry system integration
        - Small power and lighting for building
- Power, control, instrumentation and network cable installation to all required points of supply and equipment
- Plant instrumentation for monitoring, control and general system feedback (detailed in Part 3)
- Field-mounted local control stations for local equipment control
- Instrumentation field-mounted enclosures, complete with signal and power requirements
- Holistic plant, MCC and equipment earthing design and implementation
- Installation ancillaries such as cable tray, sleeving, isolation foam, junction boxes and all other items required for a complete and compliant installation

2. BULK ELECTRICAL SUPPLY TO SITE

The existing WTW is fed from a 500kVA minisub, situated adjacent to the works. The minisub is fed from an 11kV overhead line, and has a generator integrated via a manual CB selection between mains and generator, within the mains LV section of the minisub.

The minisub has adequate spare capacity for this additional Filter Feed PS load.

There are currently two LV feeds into the WTW, one for the general works and the other for the main lift pump station. Two other small CBs supply an overhead line and local lighting respectively. Adequate physical space exists for the installation of a new CB, dedicated to the new Filter Feed PS.

2.1 LV Changes

A new 150A MCCB must be installed within the LV distribution section of the minisub. The busbars have been pre-drilled, with adequate spares for integration of said new breaker. Suitably rated lugs and dropper tails must be provided between busbar and CB, with all connections heatshrunk.

A new LV supply cable must be supplied and installed from this new LV CB to the new Filter Feed PS MCC. Care will need to be taken in installing the new cable underneath the minisub plinth, as well as the gravel road crossing (which will require surface restoration to original finish, as well as the installation of sleeves). A PC SUM has further been provided if any additional plinth work/modifications needs to be done, with the installation of the LV cable at this specific section.

Careful coordination will be needed with both the electrical department, as well as the plant operators, to ensure that the intended downtime be kept as short as possible. The busbars in the minisub will need to be isolated and made safe, to ensure the work is done safely, including all checks, before energising again.

2.2 Cable Installation

The new LV cable will further need to run along the internal perimeter of the WTW, towards the new MCC. Numerous existing, underground services exist along this route. Accordingly, an underground services scan must be conducted before any excavations commence. The final cable route must then be determined as best possible. In addition, all excavations along this route must be done by hand, with special care taken to not damage any existing services.

3. MOTOR CONTROL CENTRE(MCC)

MCCs must be provided in compliance to the standard specifications, including all associated costs for manufacturing, testing, transport, rigging, installation and final site commissioning. Note the requirements for items to be claimed.

All equipment and feeds noted below are provisional, subject to final Main Contractor design and detailed tender offer. It is the responsibility of the final Main Contractor to design and size the MCC and ensure that the MCC tier arrangement is aligned in such a way (e.g. if the MCC is required to be L- or U-shaped) that it fits the space and position allocation. The final MCC design, layouts, equipment sizes and number of feeds must be coordinated with final equipment offered, and no claims will be entertained for a lack of coordination between the Contractor parties during tender stage.

3.1 New Filter Feed Construction

A new indoor MCC of the front and back access, bottom feed, floor-standing type must supplied and installed in the position as indicated on the drawings. The stand, support and all support pieces pricing must be included as part of the MCC's pricing.

The MCC design, steelwork and all required switchgear fault rating must be minimum 10kA, to be confirmed with the Engineer before construction.

The PLC, HMI, managed network switch(es) and associated equipment must be installed within a dedicated tier at the end of the MCC, with all connections and terminals mounted in the rear. Any heating and cooling requirements, specifically for the UPS, must be included as part of the MCC design and final tender offer. The HMI must be door-mounted.

Note all network and control equipment detailed in Part 2: Control System Integration.

Refer single line diagrams for detailed motor equipment sizing, subject to final Main Contractor equipment offering.

The MCC must consist of the following:

3.1.1 Incoming Section

a) Main incoming CB sized for full equipment load

b) Class 3 surge arrestors

c) Phase failure protection

d) E-Stop with indication light

e) Ethernet networked power meter

3.1.2 **Outgoing Section for Filter Feed Pumps (3 Off), Each Equipped With:**

a) Power and control equipment for motor and pump protection as well as control philosophy both internal and door-mounted, in line with section 4 below and standard specifications.

b) Variable Speed Drive (VSD) with specified protections, with sizing as per Mechanical Contractor's motor tender offer. Note the manufacturer's cooling requirements that must be complied with, and harmonic mitigation must be provided as part of the offer in-line with IEEE519 requirements. The keypad must be door-mounted.

c) Direct On Line (DOL) starter with specified protections for Filter Feed Pump motor cooling fan, with sizing as per Mechanical Contractor's motor tender offer.

3.1.3 **Outgoing Section for local fans, aircons and other ancillary equipment**

3.1.4 **Distribution Feed to MCC-mounted UPS, for PLC, HMI, network and instrumentation feeds – Essential Section**

3.1.5 **Outgoing Section for Local Lighting and Power – Non-Essential Section**

a) Local MCC-mounted socket outlet, with E/L

b) Local DB supply

c) Site lighting, with bypass and photocell circuits

3.1.6 **Networked remote monitoring and control signals for all required MCC status, instrumentation and process parameter signals for central plant monitoring and control.**

4. SYSTEM CONTROL

All plant and system control will be done by means of the PLC, with operational inputs and system adjustments to be made at local HMI. The individual control systems and overall network requirements are detailed in Part 2: Control System Integration.

Provision must however be made within the MCCs for local manual mode, with all associated protections. Should there be a communication failure, or faulty PLC, provision must be made to run the various individual components in manual mode. All available protections, whether it be field or electrically based, must continue to protect the equipment.

All required network communication, monitoring and control signals as well as protocols must be coordinated and provided between the MCC manufacturer, System Integrator and specialist instrumentation and OEM suppliers. No claims will be entertained for lack of coordination and signal/voltage disparities. This includes all inter-plant control and network cables, protocols and I/O allowances.

5. GENERAL ELECTRICAL WORK

The general electrical installation covers the supply, installation and connection of equipment provided under this contract, as well as the connection of other MCCs and control panels provided by others.

Refer standard specification SSE02 for further technical requirements.

5.1 CABLES, TRAY, EXCAVATIONS AND SUNDRIES

The Contractor must allow for the supply and installation of all required electrical, control and instrumentation cables, heavy duty cable ladder outside and within the plant as per the schedule in the Bill Of Quantities (BOQ).

Excavations on-site, including restoration and compaction of surfaces, must comply to the standard specifications.

5.2 INSTALLLATION SCHEDULE

A detailed cable, wiring and tray schedule must be compiled and maintained by the Contractor. The purpose of the schedule it to log and monitor all re-measurable items. The schedule must be complete with sections stating to and from feeds and broken down into the specific components, so as to be able to trace and audit all re-measurable components installed.

The schedule must remain live and up to date throughout the installation procedure. No payment will be made without evidence of an up to date schedule.

5.3 INSTRUMENTATION ENCLOSURES

Instrumentation housing enclosures must be manufactured from 3CR12, including all nuts, bolts, handles and hinges. The mounting configuration must be as detailed below per specific application. The equipment housing/junction box, including mounted devices, must be of the IP67 type. 50mm overhang hoods/covers must be provided for all outdoor applications in addition to the requirements above.

Internal space must be designed as such that all necessary field terminals, relays, power supplies, terminations as well as 20% spare capacity is provided for. Stations must be lockable, or only accessible by means of a tool.

These housing stations must be provided with a see-through window, to view instrumentation data. However in being mounted outdoors, sunlight degrades this window to such an extent that it becomes completely opaque. The design of this enclosure must therefore provide a window that will not degrade over time, or a latching cover must be provided that can be opened to then view through the window. An adequate solution must be presented to the Client, and approved, before any construction can commence.

Detailed labels must be provided throughout pertaining to station name, equipment designation as well as incoming and outgoing cable feeds.

5.4 LOCAL CONTROL STATIONS

Local control stations must be manufactured from Stainless Steel (SS) 304, including all nuts, bolts, handles and hinges. The mounting configuration must be as detailed below per specific application. The equipment housing/junction box, including mounted devices, must be of the IP67 type. 50mm overhang hoods/covers must be provided for all outdoor applications in addition to the requirements above.

Internal space must be designed as such that all necessary field terminals, relays, timers, terminations as well as 20% spare capacity is provided for. Stations must be lockable, or only accessible by means of a tool.

Detailed labels must be provided throughout pertaining to station name, equipment designation as well as incoming and outgoing cable feeds.

The control station must consist of:

- Green start push-button
- FWD/REV push-button (where required)
- Red Mushroom-type E-Stop with separate release mechanism

6. SYSTEM EARTHING

Where specified and indicated on the drawings and in the BOQ, dedicated Bare Copper Earth Conductors (BCEC) must be installed alongside and strapped to its associated electrical supply cable. The size of the BCEC is provisional along with the supply cable size. BCEC must be fitted crimped lugs and must be solidly bolted at both ends.

All required electrical points and paths along the installation must be solidly bonded, with the return path solidly connected to the MCC's main earth.

In addition, a dedicated earth mat must also be supplied and connected to the main MCC's earth bar. The mat must be a minimum 1m x 1m with 70mm^2 BCEC Cadwelded together, with internal grids of no more than 200mm x 200mm. The earth mat must be installed adjacent to the MCC and connected by means of a 70mm^2 BCEC to ensure an earth resistance of one ohm or less. All required excavations, connections and coordination must be included as part of the earth mat price.

Note that should the mat be installed without the initial supply cable earth wire readings provided to Engineer, then no compensation will be provided to the Contractor for the earth mat nor ancillaries.

Note that for mechanical strength reasons no BCEC may be smaller than 4mm^2.

All ancillary equipment such as nuts, bolts, hinges, etc. must be manufactured from stainless steel.

7. SMALL LIGHTING AND POWER

A Local DB must be provided, wall-mounted within the PS building, as indicated on the applicable drawings. All lighting and small power feeds must be taken from the relevant DB. The general installation must surface-mounted, including bosal and final fittings.

Socket outlets must be of the double type, provided with weatherproof cover, mounted at a minimum of 1200mm AFL.

Lights must be installed as detailed in the BOQ, per respective building. All indoor lights must be of the LED, IP65 type (with built-in surge protection and opaque diffuser), with all outdoor lights of the LED, IP66 type (with marine-grade body, built-in surge protection and indirect reflector). Wall-mounted fittings must generally be mounted at an accessible height of between 2.8-3.5m, measured from the applicable floor-level. Ceiling or roof-mounted fittings must be installed in such a position that they can again be accessed for maintenance purposes. Lights must be manufactured in RSA, bearing the SABS logo and be provided with a minimum 5-year warranty.

All internal lighting circuits to utilise a minimum of 1.5mm^2 wire, outdoor lighting circuits to utilise a minimum of 2.5mm^2 wire, with power circuits being a minimum of 2.5mm^2 wire.

Bosal must be used throughout the industrial areas, on suitable spacers, for lighting and power installation. In the areas where possible corrosion could occur (chlorination or potential water leakage areas), PVC conduit must rather be utilised.

A Certificate of Compliance (COC) must be provided for the plant as a whole.

PART 2 : CONTROL SYSTEM INTEGRATION

1. GENERAL SCOPE

The control system integration scope of works consists of the following main components:

- Utilisation of a specialist System Integrator (SI), as part of the tender offer, for holistic network and control design through overall plant integration:
- New network and control system hardware with:
    - Managed switches connecting Main MCC to telemetry, networked equipment and HMI
    - Control network cabling, complete with adequate protection
    - PLC for new MCC, with required network and I/O cards
    - MCC-mounted HMI for viewing and parameter inputs
- New network and control system software and programming with:
    - PLC control programming
    - HMI programming
    - Holistic and complete network design, MCC as well as plant-network
    - All required software once-off license fees
- Implementation and optimisation of final plant control, liaising with and coordinating all sub-contracting role-players
- Assist with design and coordination on all other electrical components

2. PLANT CONTROL

The new portion of the WTW must be designed to operate on a continuous, automated basis, through the use and control of a PLC, allowing for system parameter changes by means of HMI.

Note that manual control and protection must remain in place should the PLC be faulty.

The control philosophies below are intended requirements complying to the plant's process demands. Any changes relating to final Contractor design must be allowed for as part of the tender offer. The structure below includes a common control requirement section, applicable to all, with specific plant sections thereafter.

The control narrative must be read in conjunction with the proposed Process Flow Diagram as well as all other issued specifications and drawings.

All required monitoring and control signals must be coordinated and provided between the MCC manufacturer, System Integrator and the specialist SCADA/telemetry supplier and no claims will be entertained for lack of coordination and signal/voltage disparities. This includes all inter-plant network, control and I/O allowances.

2.1 Filter Feed Pump Control

This new pump station must pump water from its suction control sump, through the existing sand filters, which in turn feed the final lift pump station.

The suction control sump is fed with raw water, via the canal and existing clarifiers. The raw water level within the control sump must be maintained as constant as possible, ensuring an even and stable flow from the clarifiers,

through the filters, to the final lift pump station. The duty pump(s) must PID on level, to maintain a preset, constant level.

The pump station will further be phased, where in this first phase, only two pumps will be installed, to operate on a duty/standby basis (with no more than one pump to run at any time).

In the next phase of the WTW (future project), an additional pump/motor will be installed and connected to the MCC (which is now already equipped with the three pumps' starters, complete). In this future phase, the pumps must operate on a two duty, one standby basis, still having to manage and balance the level in the suction control sump.

The PLC, HMI and associated protections must now be programmed for both scenarios, and fully tested at the factory and on-site, with an interlock then provided at final taking-over, ensuring the duty/standby configuration, for this first phase.

2.1.1 Control modes

The pumps can either be run in manual or automatic mode, with automatic mode via the PLC and HMI sequence.

Each pump panel must be equipped with a three-position selector switch labelled Manual/Off/Auto, with the control as set-out below. A running pump must stop when switched to off and no pump can be initiated to run with the selector switch in the off position.

No more than one pump can run at any time (first phase), with no more than two pumps to run together in the future phase.

2.1.1.1 Manual Mode

Each pump must be started and stopped via a start and stop pushbutton on the MCC., as well as from the local control station in close proximity to the respective pump.

Note that even in manual mode, the respective hard-wired pump and motor protections must remain active to protect said equipment.

2.1.1.2 Automatic Mode

Primary Level Control

The duty pump(s) must maintain a constant level in the suction sump (with setpoints adjustable) by means of a PID control loop. The idea is that the incoming raw water must be pumped through the filters, balancing the system accordingly.

The level control must be derived by means of a 4-20mA signal from the ultrasonic level sensor in the sump. The level in the sump must remain within a safe band (not too high or low), then a LEVEL START DEMAND indication light must switch on and the PID loop must remain in effect until the level has reached a high/low stop value, at which point the indication light must switch off.

Both the band levels (stop/start), as well as PID setpoint level, must be confirmed with the process engineer during construction (in meters and/or percentage of sump level).

The tank level must be displayed on the HMI, including pump flow and pressures.

The minimum allowable frequency of the pumps, when ramping down due to the system getting to its permissible stop level, must be evaluated on-site so that the required flow and pressure is still available through the delivery pipeline (and motor cooling is managed accordingly), in conjunction with the equipment supplier.

Secondary Pressure Control

With these pump(s) pumping towards filters, maintaining the constant suction level, the delivery pressure must be monitored to ensure it does not climb too high, resulting in filter overload downstream. The common delivery pressure must therefore be monitored and equipped with warning and alarm conditions (different values), whereby the duty pump(s) are further controlled.

Should the delivery pressure exceed the permissible setpoint value (value to be confirmed during construction), with integrated delay timer, then the duty pump(s), need to ramp down to maintain permissible pressure.

Duty Selection

The pumps must be provided with a common selector switch labelled Alt/P1/P2/P3, door-mounted in the common control section. With the switch in Alt mode, the pumps must alternate their duty cycle after every 24 hours.

Should a running pump trip, be switched off (CB and selector switch) or fail to start, then the standby pump must takeover and start immediately. Should the tripped pump be fixed/reset, then it must not start up again and act as the standby pump.

In P1, P2 or P3 that selected pump must start. However, even with the selector switch in that position, the standby functionality as detailed above must still be applicable.

2.1.2 Emergency Control

Suction Low

The sump must be equipped with a low level float level switch, installed as low as possible in the sump, while still protecting the pumps from running dry, should they not stop at the programmed stop point in auto mode.

The low level float must stop any running pumps in auto and manual modes, with corresponding Low Level Alarm indication. The fault must also latch.

High Pressure

Should the pumps not adequately lower their frequency and corresponding pressure (within adjustable time, as per auto control above), and the pressure increases to a high level, then the duty pump(s) must stop (including integrated time delay).

This condition must trigger a System High Pressure alarm, in auto and manual modes, with corresponding indication. The fault must also latch.

2.1.3 Protections

The pump must be protected, in all control modes, by means of the protective devices described below. At the occurrence of a fault, the motor must STOP and a FAULT indication light must energize.

Each protective device must be accompanied with a manual reset capability, either inherently built-in, or via a separate reset door-mounted push-button. No tripped equipment may start running until a manual reset has been initiated, unless otherwise specifically specified.

- Comprehensive starter protection by means of the VFC
- Motor overheat protection by means of thermal device
- Pump high pressure protection by means of pressure sensor
- Pump no-flow protection by means of the limit switches on non-return, counter-weight arms

2.1.4 Alarm and Status Indication

Each item monitored must be provided with the relevant indication as detailed below:

a) Pump Panel (3 No)

- RUN
- STARTER TRIP

- MOTOR OVERHEAT
- HIGH PRESSURE
- NO-FLOW
- E-STOP

b) HMI

- LEVEL START DEMAND
- LOW LEVEL
- HIGH LEVEL
- SYSTEM HIGH PRESSURE
- FLOW DISPLAY
- LEVEL DISPLAY
- PRESSURE DISPLAY

2.1.5 Remote monitoring and control

The required monitoring and control signals for the plant system must be provided by means of industrial network.

Note all analogue 4-20mA signals must also be made available and communicated to the MCCs, where required. Any loop isolators required must be provided in either the field-mounted housings, or MCC.

2.2 Filter Feed Pump – Motor Cooling Fans

The filter feed pumps' motors will be supplemented with an additional fan to allow for motor cooling at lower pump speeds. Each fan will receive a run signal from its corresponding Filter Feed Pump, and run until the Filter Feed Pump stops (see applicable delay timer below).

All applicable current and future phasing for control of the Filter Feed Pumps is applicable to the control of the motor cooling fans as well. The PLC, HMI and associated protections must now be programmed for both scenarios, and fully tested at the factory and on-site, with an interlock then provided at final taking-over, ensuring the duty/standby configuration, for this first phase.

2.2.1 Control Mode

The fans will receive a run signal from the Filter Feed Pumps and start in conjunction with each pump's run signal. A delay timer (adjustable) must be provided so that once a fan's corresponding Filter Feed Pump has stopped, the fan will continue running until the timer has elapsed, after which the fan will stop.

2.2.2 Protections

The fan must be protected, in all control modes, by means of the protective devices described below. At the occurrence of a fault, the motor must STOP and a FAULT indication light must energize.

Each protective device must be accompanied with a manual reset capability, either inherently built-in, or via a separate reset door-mounted push-button. No tripped equipment may start running until a manual reset has been initiated, unless otherwise specifically specified.

- Overload Protection

2.2.3 Alarm and Status Indication

Each item monitored must be provided with the relevant indication as detailed below:

a) Pump Panel (3 No – shared with Filter Feed Pump panel)

- FAN RUN
- FAN OVERLOAD TRIP
- FAN E-STOP

2.2.4 Remote monitoring and control

The required monitoring and control signals for the plant system must be provided by means of industrial network.

Note all analogue 4-20mA signals must also be made available and communicated to the MCCs, where required. Any loop isolators required must be provided in either the field-mounted housings, or MCC.

3. INDUSTRIAL NETWORK

Refer Standard Specifications E02 for detailed technical requirements, as well as drawings indicating proposed network configurations.

All required PLC and HMI hardware and software components, including licensing, programming and configuration costs must be included as part of the tender offer. Further provision must be made in the pricing for three iterations of the HMI layout and trending requirements with the Client and Engineer.

3.1 Site Network Design

The network design must be done by a specialist System Integrator (Western-Cape based), with a proven track-record. Network design would include a detailed network drawing, equipment layout, protocol summary as well as HAZOP-type fault-finding analysis.

In all instances, the entire site network, must remain both live and self-healing (ie removal of one component may not affect the rest of the equipment in any way). Allowance must be made for at least a one-hour power backup. Refer standard specifications for ring-redundancy throughout the plant.

3.2 Software Licensing

Any software required for the network tender offer must be allowed for and accurately priced. Note that only once-off license solutions will be accepted and that no yearly-subscription offers will be accepted.

Licensing must allow for all required scan points as well as the number of operator access points at the plant.

3.3 PLC and HMI

The PLC with associated equipment must be mounted in a dedicated tier within the Main MCC. All terminals and connections must be provided for in the rear section (except in a front-access only MCC, where the terminals must be mounted in the front and bottom of the tier). A weatherproof RJ45 connection point must be door-mounted for laptop access.

The PLC offered must be of the Siemens, ABB, Schneider and/or similar type, with 25% spare capacity in terms of hardware and software capacity. All heating and ventilation requirements to be taken into account as part of the design process.

The general intent and system configuration must be that the pump station equipment can be run in manual, with required protections in place, should the PLC be faulty. All protections must therefore be hard-wired.

A 21.5” touch-screen HMI, of the Siemens, ABB, Schneider and/or similar type, setup and configured as per the standard specification requirements must be door-mounted at the PLC tier, for the Main MCC.. All licensing costs must be provided for under this contract. The HMI must be specifically suited for industrial conditions (IP65), being fanless and stainless.

All required PLC and HMI hardware and software components, including licensing, programming and configuration costs must be included under the MCC price in the BOQ.

Note graphic requirements for the HMI, as detailed below (as a minimum). Provision must be made for an iterative approval process, with three submission and Client comment rounds to be provided as part of the tender offer:

3.3.1 Main Menu

To provide an overview of the PS as a whole, including the MCC and control nodes, existing plant link, housekeeping, alarm page, trending, dashboards, process inputs, and other specification requirements.

3.3.2 New Plant - Overall

This screen displays:

- A schematic line diagram of the scheme as a whole (From PFD)
- General fault page
- Pump/Motors status
- System analogues status

3.3.3 Filter Feed System

This screen displays:

- A schematic line diagram of this section of the plant and associated equipment
- Pump/Motors status
- Each valve status
- System analogues status
- Analytical process displays
- Emergency stop active.

3.4 **Network Switches**

A network switch must be provided for at the new MCC node. It must be managed, Layer2 unit, of the Moxa and or similar type. The switch sizing and design must be specific per node, depending on the amount of units to be connected at that node. Spare ports must be allowed for (minimum 2). The final switch design remains the responsibility of Contractor and SI.

3.5 **Component Programming**

As the plant will be dependent upon the PLC and control implementation, careful consideration must be placed on the programming and implementation portion of the project.

The programming will be a function of these specification requirements but optimised and adjusted as per final Contractor design offer.

PART 3 : INSTRUMENTATION

1. GENERAL SCOPE

All instrumentation wired from the MCC must be equipped with dedicated Class 3 inline surge protection, complete with visual indicator. Instrumentation must be supplied through the dedicated Inverter feed.

The intention of the instrumentation installation is to allow for communication between the instrumentation and PLC as far as possible.

Field instrumentation controllers/displays must be mounted in the field, at an accessible and visible location, in close proximity to the measured entity. Provision has been made under the LV electrical section of outdoor viewing/housing enclosures, for this specific purpose.

Refer to Standard Specification SSE03 for detailed instrumentation requirements

1.1 LEVEL INSTRUMENTATION

1.1.1 Ultrasonic Level Sensor

A new ultrasonic level sensor must be of the Endress & Hauser and/or similar type and must have at least 4 programmable relays and operate on a 4-20mA basis.

The level sensor must be mounted within the sump via a stainless steel bracket against the sump soffit, with the controller mounted within the common control section of the MCC.

Both the analogue value as well as digital relay outputs must be taken to the PLC I/O cards.

- 1x for Common Control Sump

1.1.2 Float Level Switches

New float level switches (24VDC) must be provided that are specifically suited to water applications. Refer to Standard Specifications SSE03 for further technical detail.

Float level switches must be provided for the following:

- 2 x Common Control Sump (High and Low Alarm)

1.2 FLOW INSTRUMENTATION

1.2.1 Electromagnetic Flow Meter

The electromagnetic flow meter must be of the Endress + Hauser and/or similar type.

Sensor Diameter: To suit new pipework (refer mechanical specifications and contractor offer)

- Flange Type: To suit new pipework (including class type)
- Lining: Suitable for raw water
- Flow speed range: 0.01 – 10m/s
- Flow rate range: 0 – 200l/s
- Accuracy: 0.5% or less
- Transmitter: Field mounted (IP68)
- Power Supply: 24VDC (preferably)

- Output: 4-20mA proportional to flow, frequency/pulse outputs (all forward and reverse) and Modbus
- Suitable for In-line or in position calibration of the flow meter

Electromagnetic Flow Meter must be provided for the following:

- 1x for Main Pump Common Discharge
- 1x per Filter Backwash Line (4x in total)

1.2.2 PROXIMITY LIMIT SWITCHES

Proximity, non-contact limit switches (24VDC) must be provided for each pump's non-return lever arm for no-flow protection. The limit switches must be minimum IP67 and suited for the specific industrial application. Switches must be provided for the following:

- 1x per Main Pump check valve lever arm for no-flow protection (2x in total).

1.3 PRESSURE INDICATING TRANSMITTERS

Provision must be made on each pump's delivery pipework, as well as the common delivery manifold for the installation of a pressure sensor. The manufacturer must be of the Endress+Hauser, IFM, Vega, and/or equivalent type.

The units must be of the 4-20mA type only. The pressure sensor must be fitted with a display showing the process value. Coordination between all parties should be carried out to ensure that the correct pipe process connection fittings are installed suited to the pressure sensor process connection, or sensor process connection suited to the pipe process connection fitting installed, no cost claims will be otherwise entertained. The pressure sensor offered must be able to handle water hammers and pressure spikes.

Pressure sensors must be installed for the following:

- 1x per pump delivery pipework (2 in total)
- 1x for pump common delivery manifold (1 in total)
- 1x Upstream of filters
- 1x Downstream of Filters

1.3.1 Technical Requirements

- Sensor Diameter: Socket-installed (size to suite equipment)
- Measuring range: 0bar – Max shut-off for duty pumps
- Sensor: Capacitive
- Membrane: Ceramic
- Accuracy: 0.5% or less
- Transmitter: Integral (IP68)
- Power Supply: 24VDC (preferably)
- Output: 4-20mA proportional to system pressure
- Display: LED Alphanumeric

PART 4 : TELEMETRY AND SCADA

1. GENERAL SCOPE

This section of the Project Works requires a dedicated and specialist sub-contractor to execute the required Works. Close cooperation is critical between the Main Contractor, specialist sub-contractor as well as MCC manufacturer and no claims in this regard will be entertained.

The project specification covers the related design, construction, supply, delivery, installation, testing, commissioning and site optimisation of a radio telemetry and central SCADA system.

Currently the scope must be further defined, with PC SUM allocations made for specific portions of the intended scope. Quotations will be requested from specialist suppliers once a Main Contractor has been appointed. The Main Contractor will be expected to assist in the quotation process.

This project's estimated scope of works could include:

- Expansion of the existing telemetry outstation in the existing, adjacent pump station, to integrate with the new pump station's signals
- All required interfacing, coordination and control between the outstation and MCC
- Existing central SCADA system upgrades, including possible web integration
- Data storage, dashboard monitoring pages and possible reporting.

C3.8 TEMPORARY WORKS

1. GENERAL

The Contractor shall allow for all costs involved for temporary works, confirmation of existing and new services, including all plant, labour and materials required. The Contractor shall allow for sufficient trips to site for the required coordination and confirmation to complete the tasks.

2. METHOD STATEMENTS FOR SWITCHOVERS

The Contractor shall submit method statements describing the temporary – and permanent works and how the switch-over at the pump installation will be done, indicating what influence and risks it has for the Employer. This method statement shall be submitted to the Engineer for approval (both by the Client and Engineer) at least four weeks (20 working days) prior to the planned shut-down / installation work. No work shall commence prior to approval by both parties. The Contractor shall allow at least two to three weeks for the discussion and approval process in the construction programme for this.

Sufficient allowance shall be made for the Contractor (and applicable sub-contractors) to visit the site to gather information required to compile the method statements. This cost shall be included in the cost of compiling such method statement

The Contractor shall make allowance for workshop sessions with the Client and Engineer to discuss and work through each of the method statements regarding switch-over of the installations. The workshop shall be a full day session, based in Bonnievale at the Client's facility. The Contractor shall have representatives present for the mechanical, electrical and civil disciplines, including all travelling time and cost involved to attend the session.

The installation may only happen 5 working days after approval is provided.

3. TEMPORARY WORKS

The Contractor shall be responsible for keeping the existing works live during the construction and installation periods, ensuring the plant is operating within the regulations.

The Contractor is responsible for the design, implementation and maintenance of all temporary required to implement the scope of work. This shall include all sewage handling during the construction, testing and commissioning, and trial operation period.

The Contractor shall also allow for all Health and Safety requirements that additional may be required. Provision shall be made for all labour, material and machinery required shall cover all discipline, including but not limited to the civil, mechanical and electrical (LV and instrumentation).

4. CONFIRMATION OF EXISTING SERVICES

The Contractor shall allow for sufficient trips to site for the identification, confirmation and coordination of existing services such as underground pipework, electrical cables, electrical supply to site, etc. required for the compilation of the method statements and ordering of equipment.

5. REMOVAL OF EQUIPMENT

The Contractor shall allow for all costs, including labour, material and machinery required, involved for the removal of the existing mechanical and electrical redundant equipment, cleaning and disinfecting all equipment, and transporting and delivering it to the Municipal store in Bonnievale.

This shall include the breaking out of puddle pipes out of the existing concrete / brick structures as well as removing underground pipework around the pump station such as suction or delivery manifolds and common pipework.

C3.9 CIVIL PARTICULAR SPECIFICATIONS

PSA GENERAL (1986)

PSA 1 **SCOPE**

Replace subclause 1.1 with the following:

"1.1 This specification covers requirements, principles and responsibilities of a general nature which are normally applicable to all civil engineering contracts as well as the requirements for the contractor's establishment on site."

PSA 2 **INTERPRETATIONS**

PSA 2.3 **Definitions**

In the opening phrase between the words “specification” and “the following”, insert the words “the definitions given in the conditions of contract and “

(a) General

Add the following definitions:

“Employer’s Agent: All references in the SANS specifications referring to the Engineer shall also be deemed to refer to the Employer’s Agent in terms of the General Conditions of Contract.

General conditions: The general conditions of contract specified for use with this contract and the special conditions of contract as applicable.

Specified: As specified in the standardised specifications, the drawings or the project specifications. Specifications shall have the corresponding meaning."

(c) Measurement and payment

Replace the definitions for fixed charge and time-related charge with the following:

"Fixed charge: A charge that is not subject to adjustment on account of variation in the value of the contract amount or the contract time of completion.

Time-related charge: A charge, the amount of which is varied in accordance with the time for completion of the work as adjusted in accordance with the provisions of the contract.

PSA 2.4 **Abbreviations**

(a) Abbreviations relating to standard documents

Add the following abbreviation:

"CKS : SABS Co-ordinating Specification."

PSA 3 **MATERIALS**

PSA 3.1 **Quality**

Add the following:

"All manufactured materials supplied shall be new materials unless the contrary is specified. All materials specified in accordance with SABS specifications shall bear the SABS mark, whether so specified or not. Copies of SABS Certificates of all materials used must be submitted to the Employer’s Agent."

Add the following:

"The Contractor must provide the Employer's Agent with at least 48 hours notice prior to control testing being required. Furthermore, the contractor must make provision in his programme for the undertaking, and calculation of results, of such testing. Construction of layer works over areas for which test results are not available will be undertaken at the Contractors own risk."

Add the following subclause(s)

"PSA 3.3 **Ordering of Materials**

The quantities set out in the schedule of quantities have been determined from calculations based on data available at the time and should therefore be considered to be only approximate quantities. The contractor shall therefore, verify the quantities before ordering materials of any kind. No liability or responsibility whatsoever shall be attached to the employer for materials ordered by the contractor except if they have been ordered in accordance with written confirmation issued by the Employer's Agent.

PSA 4 **PLANT**

Replace the heading of PSA 4 with :

"PSA 4 Construction Equipment".

PSA 4.1 **Silencing of Plant**

Replace the heading of "PSA 4.1 Silencing of plant" with :

"PSA 4.1 Silencing of Construction Equipment".

Replace the contents of subclause 4.1 with the following :

"The Contractor's attention is drawn to the applicable regulations pertaining to noise and hearing conservation, framed under the Occupational Health and Safety Act (Act No. 85 of 1993) as amended.

The Contractor shall at all times and at its own cost, be responsible for implementing all necessary steps to ensure full compliance with such regulations, including but not restricted to the provision and use of suitable and effective silencing devices for pneumatic tools and other Construction Equipment which would otherwise cause a noise level in excess of that specified in the said regulations.

Where appropriate, the Contractor shall further, by means of temporary barriers, effectively isolate the source of such noise in order to comply with the said regulations."

PSA 4.2 **Contractor's Offices, Stores and Services**

Add the following paragraph before the first paragraph:

"The Contractor's construction camp shall be fenced off and shall contain all offices, stores, workshops, testing laboratories, toilet facilities, etc. The camp shall always be kept in a neat and tidy condition.

No personnel will be allowed to reside on the site. Only night-watchmen may be on the site after hours."
Add the following to the second paragraph:

"The Contractor shall provide on the Site and in close proximity to the actual locations where the work is being executed, one toilet per 10 workmen, which toilets shall be effectively screened from public view and their use enforced. Such toilets shall be relocated from time to time as the location of the work being executed changes, so as to ensure that easy access to the toilets is maintained.

The contractor shall, where applicable, make all necessary arrangements and pay for the removal of night soil."

"PSA 4.3 **Site Security**

The area within the area used by the Contractor for the establishment of his camp site may be subject to a security risk. The Contractor must assess the additional risk and make his own provision for additional protection.

No separate payment will be made for these additional security measures and the cost thereof will be deemed to be included in the rates tendered for Items PSA 8.3 and PSA 8.4. Should the Contractor feel that he needs additional insurance to cover these risks, the cost of such insurance will also be deemed to be included in the tendered rates."

PSA 5 **CONSTRUCTION**

PSA 5.1 Survey

PSA 5.1.2 Preservation and replacement of survey beacons and pegs subject to the Land Survey Act

Delete the words "in the vicinity of boundaries" in the second sentence of Subclause 5.1.2 and replace the words "under the direction of" in the same sentence with "in consultation and liaison with".

Add the following after the second sentence of Subclause 5.1.2 :

"The Contractor and the Employer's Agent shall record on the said list, their concurrence or disagreement (as the case may be) regarding the completeness and accuracy of the details recorded therein."

Replace the third sentence of Subclause 5.1.2 with the following :

"At the completion of the Contract, the Contractor shall expose all pegs that were listed at the commencement of the construction as being in order and the Contractor shall arrange with a registered Land Surveyor for the checking of the positions of all such pegs and the replacement of those that the Land Surveyor's check reveals have become disturbed or damaged. The Contractor shall, as a precedent to the issue of the Certificate of Completion, provide to the Employer's Agent, a certificate from the registered land surveyor, certifying that all the pegs listed at the commencement of construction in accordance with the provisions of this clause, have been checked and that those found to have been disturbed, damaged or destroyed have been replaced in their correct positions, all in accordance with the provisions of the said Act.

The costs of all checking, replacement and certification as aforesaid shall be entirely for the Contractor's account. This, with the provision always that the Contractor shall not be liable for the cost of replacement of pegs which :

(a) cannot reasonably be re-established in their original positions by reason of the finished dimensions of the permanent works, and

(b) the Contractor can prove beyond reasonable doubt to the satisfaction of the Employer's Agent, were disturbed, damaged or destroyed by others beyond his control."

PSA 5.3 **Protection of Existing Structures**

Replace :

"Machinery and Occupational Safety Act, 1983, (Act No. 6 of 1983)" *WITH :* "Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), as amended," and insert the following after "(Act No. 27 of 1956)" : "as amended".

PSA 5.4 **Protection of Overhead and Underground Services**

Replace the heading and the contents of this subclause with the following:

"PSA 5.4 **Location and Protection of Existing Services**

PSA 5.4.1 Location of existing services

Before commencing with any work in an area, the Contractor shall ascertain the presence and actual position of all services that can reasonably be expected by an experienced and competent Contractor to be present on, under, over or within the Site.

Without in any way limiting its liability in terms of the Conditions of Contract in relation to damage to property and interference with services, the Contractor shall, in collaboration with the Employer's Agent, obtain the most up-to-date plans as are available, showing the positions of services existing in the area where it intends to work. Neither the Employer nor the Employer's Agent offer any warranty as to the accuracy or completeness of such plans and because services can often not be reliably located from plans, the Contractor shall ascertain the actual location of services depicted on such plans by means of careful inspection of the Site and the provision and utilisation of suitable detecting and testing equipment.

Thereafter, the Contractor shall, by the use of appropriate methodologies carefully expose the services at such positions as are agreed to by the Employer's Agent, for the purposes of verifying the exact location and position of the services. Where the exposure of existing services involves excavation to expose underground services, the further requirements of Sub-clauses 4.4 and 5.1.2.2 of SABS 1200D (as amended) shall apply.

The aforesaid procedure shall also be followed in respect of services not shown on the plans but which may reasonably be anticipated by an experienced Contractor to be present or potentially present on the site.

All services, the positions of which have been determined as aforesaid at the critical points, shall henceforth be designated as 'Known Services' and their positions shall be indicated by the Contractor on a separate set of Drawings, a copy of which shall be furnished to the Employer's Agent without delay.

As soon as any service, which has not been identified and located as described above is encountered on, under, over or within the Site, it shall henceforth be deemed to be a Known Service and the aforesaid provisions pertaining to locating, verifying and recording its position on the balance of the Site shall apply. The Contractor shall notify the Employer's Agent immediately any such service is encountered or discovered on the Site.

Whilst it is in possession of the Site, the Contractor shall be liable for all loss of or damage as may occur to :

(a) Known Services, anywhere along the entire lengths of their routes, as may reasonably be deduced from the actual locations at which their positions were verified as aforesaid, due cognisance being taken of such deviations in line and level which may reasonably be anticipated ; and

(b) any other services which ought reasonably to have been a Known Service in accordance with the provisions of this clause ;

as well as for consequential damage, whether caused directly by the Contractor's operations or by the lack of proper protection ;

Provided always that the Contractor will not be held liable in respect of damages occurring to services not being Known Services.

No separate payment will be made to the Contractor in respect of its costs of providing, holding available on the Site and utilising the said detecting and testing equipment, nor for any costs incurred in preparing and submitting to the Employer's Agent, the Drawings as aforesaid and these costs shall be deemed included in the Contractor's other tendered rates and prices included in the Contract.

Payment to the Contractor's in respect of exposing services at the positions agreed by the Employer's Agent and as described above will be made under the payment items (if any) as may be provided therefor in the respective sections of the Specifications pertaining to the type of work involved.

PSA 5.4.2 Protection during construction

The contractor shall exercise all the necessary care to prevent damage to known services during construction operations. Major excavating equipment and other plant shall not be operated in dangerously close proximity of these services. Where necessary, excavation in close proximity of these services shall be carefully carried out by means of suitable hand tools, excluding picks wherever their use could cause damage to the services.

Services left exposed shall be suitably protected from damage.

PSA 5.4.3 Alterations and repairs to existing services

Unless the contrary is clearly specified or ordered, the contractor shall not carry out any alterations to existing services. Where this may be necessary, the contractor shall inform the Employer's Agent, who will either make arrangements for such work to be executed by the owner of the service or instruct the contractor to make such arrangements himself.

1. Where existing services are damaged by the contractor, he shall immediately inform the Employer's Agent, or when this is not possible, the relevant authority, and shall obtain instructions as to who should carry out repairs. In urgent cases the contractor shall take all necessary steps to minimise damage to and the interruption of the service. No repairs shall be attempted to telecommunication cables or electric power lines and cables.

No liability for damages arising from any delay in having such alterations or repairs effected will be accepted by the employer. The contractor shall provide all reasonable opportunity, access and assistance to persons doing alterations or repairs to existing services."

PSA 5.7 **Safety**

Replace the contents of subclause 5.7 with the following :

"Pursuant to the provisions of the Conditions of Contract, and without in any way limiting the Contractor's obligations thereunder, the Contractor shall at its own expense (except only where specific provision (if any) is made in the Contract for the reimbursement to the Contractor in respect of particular items):

(a) Provide to its Employees on the Site of the Works, all safety materials, clothing and equipment necessary to ensure full compliance with the provisions of the Occupational Health and Safety Act (Act No 85 of 1993) and Construction Regulations as amended (hereinafter referred to as the Act) at all times, and shall institute appropriate and effective measures to ensure the proper usage of such safety materials, clothing and equipment at all times; and

(b) Provide, install and maintain on all barricades, safety signage and other measures to ensure the safety of workmen and all persons in, on and around the Site, as well as the general public; and

(c) Implement on the Site of the Works, such procedures and systems and keep all records as may be required to ensure compliance with the requirements of the Act at all times; and

(d) Implement all necessary measures as to ensure compliance of the Act by all subcontractors engaged by the Contractor and their employees engaged on the Works; and

(e) Comply fully with all other requirements pertaining to safety as may be specified in the Contract.

The Employer and the Employer's Agent shall be entitled, although not obliged, to make such inspections on the Site, as they shall deem appropriate, for the purpose of verifying the Contractor's compliance with the requirements of the Act. For this purpose, the Contractor shall grant full access to the Site of all parts of the Site and shall co-operate fully in such inspections and shall make available for inspection, all such documents and records as the Employer's and/or Employer's Agent Representative may reasonably require.

Where any such investigations reveal, or where it comes to the Employer's Agent's attention that the Contractor is in any way in breach of the requirements of the Act or is failing to comply with the provisions of this clause, the Employer's Agent shall, in accordance with the provisions of Clause 8.9 of the Conditions of Contract, be entitled to suspend progress on the Works or any part thereof until such time as the Contractor has demonstrated to the satisfaction of the Employer's Agent, that such breach has been rectified.

The Contractor shall have no grounds for a claim against the Employer for extension of time and/or additional costs if the progress on the Works or any part thereof is suspended by the Employer's Agent in terms of this clause and the Contractor shall remain fully liable in respect of the payment of penalties for late completion in accordance with the provisions of Clause 8.8 of the Conditions of Contract should the Contractor fail to complete the Works on or before the specified Due Date for Completion in consequence of the suspension.

Persistent and repeated breach by the Contractor of the requirements of the Act and/or this clause shall constitute grounds for the Employer's Agent to act in terms of Sub-Clause 15 of the Conditions of Contract and for the Employer to cancel the Contract in accordance with the further provisions of the said Clause.

Add the following subclause:

"PSA 5.9 **Site Meetings**

The Contractor or its authorised agent will be required to attend regular site meetings, which shall normally be held twice a month on dates and at times determined by the Employer's Agent, but in any case whenever reasonably required by the Employer's Agent. Unless otherwise indicated in the Contract or instructed by the Employer's Agent, such meetings shall be held at the Contractor's offices on the Site. At such monthly meetings, matters such as general progress on the Works, quality of work, problems, claims, payments, and safety etc, shall be discussed, but not matters concerning the day-to-day running of the Contract."

PSA 6 **TOLERANCES**

Add the following subclause:

PSA 6.2 **Degrees of Accuracy**

Add to the subclause:

"Degree of Accuracy 1 shall be applicable to the following parts of the Works unless stated to the contrary elsewhere; weirs, flanges at civil/mechanical interfaces."

"PSA 6.4 **General**

No guarantee is given that the full specified tolerances will be available independently of each other, and the contractor is cautioned in regard to the fact that the liberal or full use of any one or more of the tolerances may deprive him of the full or any use of tolerances relating to other aspects of the work.

Except where the contrary is specified or when clearly not applicable, all quantities shall for purpose of measurement and payment be determined from the 'authorised' dimensions. This shall be taken to mean the dimensions as specified or shown on the drawings or, if changed, as finally instructed by the Employer's Agent, without any allowance for the tolerances specified. Save as hereinafter specified to the contrary, all measurements for determining quantities for purposes of payment will be based on the "authorised" dimensions.

If the work is therefore constructed in compliance with the "authorised" dimensions plus or minus any tolerances allowed, quantities will be based on the "authorised" dimensions regardless of the actual dimensions to which the work has been constructed."

When the work is not constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, the Employer's Agent may nevertheless, at his sole discretion, accept the work for payment. In such cases no payment shall be made for quantities of work or material in excess of those calculated for the 'authorised' dimensions, and where the actual dimensions are less than the 'authorised' dimensions minus the tolerance allowed, quantities for payment shall be calculated based on the actual dimensions as constructed."

PSA 7 **TESTING**

PSA 7.1.1 Checking

Replace the last sentence with the following:

"The contractor shall obtain the services of an independent testing laboratory at his own expense (Refer subclause C3.4.7.1 of the project specifications) to carry out such checks as are prescribed in the various standardised specifications."

PSA 7.1.2 Standard of finished work not to specification

Insert the words "or checks by an approved laboratory ..." after the words "Where the Employer's Agent's checks ..." in the first line of Subclause 7.1.2.

PSA 7.2 **Approved Laboratories**

REPLACE THE CONTENTS OF SUB-CLAUSE 7.2 WITH THE FOLLOWING:

"Unless otherwise specified in the relevant specification or elsewhere in the Project Specification, the following shall be deemed to be approved laboratories in which design work, or testing required in terms of a specification for the purposes of acceptance by the Employer's Agent of the quality of materials used and/or workmanship achieved, may be carried out :

(a) any testing laboratory certified by the South African National Accreditation Systems (SANAS) in respect of the nature and type of testing to be undertaken for the purposes of the Contract ;

(b) any testing laboratory owned, managed or operated by the Employer or the Employer's Agent ;

(c) any testing laboratory established and operated on the Site by or on behalf of the Employer or the Employer's Agent.

PSA 8 **MEASUREMENT AND PAYMENT**

PSA 8.1 **Measurement**

PSA 8.1.1 Method of Measurement, All Sections of the Schedule

Delete the words *:* "and South West Africa".

PSA 8.1.2 Preliminary and general items or section

PSA 8.1.2.1 *Contents*

Delete item (c).

PSA 8.1.2.2 *Tendered sums*

Replace the contents of this subclause with the following:

"The contractor's tendered sums under items PSA 8.3 and PSA 8.4 shall collectively cover all charges for:

- Risks, costs and obligations in terms of the general conditions of contract and of this standardised specification, except to the extent that provision is made in these project specifications to cover compensation for any of these items of work.
- Cost of all wayleaves.
- Head-office and site overheads and supervision.
- Profit and financing costs.
- Expenses of a general nature not specifically related to any item or items of permanent or temporary work.
- Providing facilities on site for the contractor's personnel, including offices, storage facilities, workshops, ablutions, for providing services such as water, electricity, sewerage, sewage and rubbish disposal, for access roads and all other facilities required as well as for the maintenance and removal on completion of the works of these facilities and the cleaning-up of the camp site on completion of the works.
- Providing facilities for the Employer's Agent and his staff as specified in C3.4.5.
- Providing and erecting two new contract name boards as shown on the drawings.
- Providing all the required documentation described in Part C3.
- Adhering and complying with the client's Procurement requirements including the monthly completion of labour and remuneration records."

PSA 8.2 **Payment**

PSA 8.2.1 Fixed-charge and value-related items

Replace the contents of this subclause with the following:
"Payment of fixed charges in respect of item 8.3.1 will be made as follows:

Eighty per cent (80%) of the sum tendered will be paid once the facilities have been provided and approved. The remaining twenty per cent (20%) will be paid once the works have been completed, the facilities removed and the camp-site cleared and cleaned.

Payment for the sum tendered under item 8.3.2 will be made in three separate instalments as follows:

(a) The first instalment which is 40% of the sum, will be paid when the contractor has met all his obligations to date under this specification, the general conditions of contract and the special conditions of contract, and where the value of work certified for payment, excluding materials on site and any payments under preliminary and general items is equal to not less than 5% of the total value of the work listed in the schedule of quantities.

(b) The second instalment, which is 40% of the sum, will be made when the amount certified for payment, including retention moneys but excluding the second instalment referred to herein, exceeds 50% of the tender sum.

(c) The final payment, which is 20% of the sum, will be made when the works have been certified as completed and the contractor has fulfilled all his obligations to date under this specification, the general conditions of contract and the special conditions of contract.

Should the value of the measured work finally completed by more or less than the tender sum, then the sum tendered under item 8.3.2 will be adjusted pro rata up or down and this adjustment shall be applied to the third instalment. No

adjustment will apply to item 8.3.1 in respect of variations in the value of work done or the time for completion finally authorised."

PSA 8.2.2 Time-related items

Replace the contents of this subclause with the following:

"Three time related items shall be scheduled and shall be full compensation for all time related preliminary and general costs and shall include the following :

- Public holidays
- Year-end break(s) not exceeding 15 working days in duration; and
- The contract period during the normal industry working period outside public holidays and outside the industry shutdown period during December and January.

Subject to the provisions of 8.2.3 and 8.2.4, payment under item 8.4.1 (time-related item) will be made as follows :

PSA 8.2.2.1 The contract period during the normal industry working period payment ..... **Unit : Sum**

Payment will be made monthly in equal amounts, calculated by dividing the sum tendered for the item by the tendered contract period in Days (excluding public holidays and the year-end break during December and January), provided always that the total of the monthly amounts so paid for the item is not more than in proportion to the progress of the work as a whole.

Should the Employer's Agent grant an extension of the time for completion of the works, the Contractor will be entitled to an increase in the sum tendered for the time-related item, which increase shall be in the same proportion to the original tendered sum as the extension of time is to the original time for completion of the works.

PSA 8.2.2.2 *Public Holidays* ..... **Unit : No of Statutory Public Holidays**

The tendered amount per day will be payable for the number of statutory public holidays included in the contract period which replaces normal working days.

Should an extension of time be granted and a public holiday is within this period, the Contractor will be entitled to additional payment for each additional public holiday which replaces a working day.

PSA 8.2.2.3 *Year-end break(s) not exceeding 15 working days in duration* ..... **Unit : Sum**

The tendered sum will be payable for the year-end break(s) not exceeding 15 working days in duration which falls within the construction period. Should an extension of time be granted which extends the contract period beyond the year-end break, the Contractor will be entitled to payment as tendered for this item 8.2.2.3.

Payment for such increased amounts determined in accordance with PSA 8.2.2.1 to PSA 8.2.2.2 will be taken to be in full compensation for all additional time-related preliminary and general costs, that result from the circumstances pertaining to the extension of time granted."

PSA 8.3 **Scheduled Fixed-Charge and Value-Related Items**

Replace the items with the following:

"PSA 8.3.1 Fixed preliminary and general charges ..... **Unit : Sum**

PSA 8.3.2 Value-related preliminary and general charges ..... **Unit : Sum**

The sums tendered shall collectively include full compensation for all fixed and value-related preliminary and general charges as described in subclause PSA 8.1.2.2. Payment will be made as described in subclause PSA 8.2.1."

Add the following subclause:

"PSA 8.3.5 Locate, record, protect and reinstate pegs ..... **Unit : Sum**

This item must cover all costs incurred to locate, record and protect pegs during the duration of the contract and the reinstatement of all disturbed pegs on completion of the contract in the manner as prescribed by the Land Survey Act."

PSA 8.4 **Scheduled Time-Related Items**

Replace the items with the following:

"PSA 8.4.1 Time-related preliminary and general charges

PSA 8.4.1.1 *The contract period during the normal industry working period payment* ..... **Unit : Sum**

PSA 8.4.1.2 *Public Holidays* **.....Unit : No**

PSA 8.4.1.3 *Year-end break(s) not exceeding 15 working days in duration* ..... **Unit : Sum**

The sums and rate tendered for items PSA 8.4.1.1 to PSA 8.4.1.3 shall include full compensation for all time-related preliminary and general charges as described in subclause PSA 8.1.2.2. Payment will be made as described in subclause PSA 8.2.2."

PSA 8.5 **Sums Stated Provisionally by The Employer's Agent**

Replace the contents of Subclause 8.5 with the following :

"PSA 8.5.1 Works Executed by the Contractor

The Contractor will be reimbursed in substitution of the Provisional Sums (if any) allowed in the Schedule of Quantities for work to be executed by the Contractor, in the amounts determined in accordance with the provisions of Clause 13.4 of the Conditions of Contract.

PSA 8.6 **Prime Cost Items**

Replace Subclause 8.6 with the following :

"PSA 8.6 **Prime Cost Sums**

(a) Description of Item to which Prime Cost Sum Applies ..... Unit : PC Sum

(b) Charge required by Contractor on Sub-item (a) above ..... Unit : %

Sub-items (a) and (b) will be provided in the Schedule of Quantities for each different item to which a Prime Cost Sum applies.

The Contractor shall be reimbursed under sub-item(s) (a) in substitution of the respective Prime Cost Sums included in the Contract, the actual price(s) paid or payable by him in respect of the goods, materials or services supplied, but excluding any charges for the Contractor's labour, profit, carriage, establishment or other charges related to such goods, services or materials.

The Contractor shall be paid under sub-item (b), the respective percentage, as stated by the Contractor in its Tender, of the amount certified by the Employer's Agent for payment under the related sub-item (a). The percentages tendered by the Contractor for each respective sub-item (b) included in the Schedule of Quantities shall be deemed to in full and final compensation to the Contractor in respect of any charge by the Contractor for labour, carriage profit, establishment and for any other charges related to the goods, services or materials supplied under the related sub-item (a).

If the Contractor shall have omitted within its Tender to insert a tendered percentage under sub-item (b), or tendered a zero percentage, the Contractor's tendered rate for sub-item (b) shall be deemed to be zero and the Contractor shall not be entitled to any payment under sub-item (b)."

PSA 8.7 **Daywork**

Replace the contents of Subclause 8.7 with the following :

"Measurement and payment shall be in accordance with the provisions of Sub-clause 13.5 of the Conditions of Contract."

Add the following item:

PSA 8.8 **Temporary Works**

PSA 8.8.2 Accommodation of traffic ..... **Unit : sum**

Add the following:

"This amount shall cover all costs in respect of the provision, erection, moving, re-erection and maintenance of all barriers, road signs, lights and flagmen necessary for the protection of the works, for the construction, gravelling and maintenance of detours and entrance roads affected by the work, as well as the breaking up and removal thereof at the contract completion, and for compliance with all necessary traffic rules and regulations, liaising with the road authorities, and all other costs necessary in respect of accommodation of traffic."

Replace item 8.8.4 with the following:

"PSA 8.8.4 Location and protection of existing services

Where particular items are provided in other sections of the schedule the costs of detection, exposure, protection and alterations shall be covered by such particular items. Where no such particular items are provided and where there is reason to expect the presence of such a service or services, the following items will apply:

PSA 8.8.4.1 *Provision of detecting devices for :*

The tendered rate shall include full compensation to provide a scanner to detect steel pipes and a scanner to detect electrical cables and to mark the position of these services on site.

(a) Water and sewer pipes ..... **Unit : Sum**

(b) Electrical and other cables ..... **Unit : Sum**

(c) Other ..... **Unit : Sum**

PSA 8.8.4.2 *Hand excavation necessary for locating and exposing existing services in all materials:*

(a) In roadways ..... **Unit : m³**

(b) In all other areas ..... **Unit : m³**

The rates shall cover the cost of excavating by means of hand tools within authorised dimensions, for all precautionary measures necessary to protect the services from damage during excavation and backfilling and for subsequent backfilling and compacting. Compaction of material in all areas except in roadways shall be to 93% of modified AASHTO density.

The rate for hand excavation in roadways shall also include compensation for compacting excavated or selected backfill material to 100% of modified AASHTO density. Reinstating layerworks and surfacing shall be measured and paid for under SABS 1200 DB.

The tendered rates shall also include for keeping excavations safe, for dealing with surface and subsurface water and for removal of surplus excavated material from the site."

Add the following items :

"PSA 8.8.7 Dealing with water ..... **Unit : Sum**

The sum shall cover the cost for the provision, operation, maintaining and removal of all plant and materials required to deal with surface and subsurface water anywhere on the Site as required in terms of Subclause 5.1.3 of SABS 1200 D and Subclause 5.1.2 of SABS 1200 DB. No additional payment will be made for "Special water hazards".

The sum shall cover the cost of providing the necessary plant or materials, or both, fully erected and operative on the Site, the cost of operating and maintaining pumps, well points, sheeting, close timbering, and other equipment, as applicable, for 24 hours a day, 7 days a week, throughout the period during which the facilities are required, and the cost of removing such goods and restoring the Site to its original condition on completion of that part of the project for which the temporary works were erected.

Equal monthly payments will be made calculated by dividing the sum tendered for the item by the tendered contract period in months. The sum of the equal monthly payments shall not exceed the sum tendered for this item except where an extension of the contract period is approved by the Employer's Agent in which case the monthly payments will be made pro rata to the extension of time only if dealing with water is required."

PSA 8.8.8 Temporary fence minimum 1,2 m high ..... **Unit : m**

The tendered rate shall include full compensation for the supply and erection of the temporary fence, the maintenance of the fence and the dismantling of the fence.

The contractor shall erect a temporary high visibility barrier fence at the positions as shown on the drawings or as instructed. The tendered rate shall include full compensation for the supply, erection and maintenance of the fence and the removal thereof on completion of the civil contract. It shall at all times be kept in an upright and neat condition.

PSA 8.8.9 Dismantle and re-erect temporary 1,2 m high fence ..... **Unit : m**

The tendered rate shall include full compensation for the careful dismantling of the temporary high visibility barrier fence, the stacking, loading, transporting, off-loading and re-erection of the fence at a new required position. It will also include for the maintenance of the fence and the removal there-of at the end of the construction activities.

PSA 8.8.10 Dust control..... **Unit : Sum**

The tendered rate shall include full compensation for the provision of a water truck on site on a continuous basis during the construction of earthworks and layerworks period and the regular wetting of the construction area to prevent any dust disturbance to adjacent areas.

Add the following :

"PSA 8.9 **Standing Time Cost**

(a) Plant ..... **Unit : Day**

(b) Labour ..... **Unit : Day**

(c) Other .....

The sum tendered for this item shall allow for full compensation for all standing time costs of whatever nature, and approved by the Employer's Agent.

For purposes of calculating the standing time costs, a working week will be held to consist of five working days.

The amount by which the standing time costs is adjusted shall only apply to delays which, in the opinion of the Employer's Agent, are incurred as a result of a riot, commotion, politically motivated sabotage and acts of terrorism or disorder outside the Contractor's control.

Costs for delays incurred for all other circumstances shall be treated as provided for in the Conditions of Contract.

The provision of this Clause shall in no way prejudice the right of either the Employer or the Contractor to terminate the Contract in terms of the provisions of Clause 18.5 of the General Conditions of Contract.

Variations in the Total Tender Sum resulting from payment for delays as a result of standing time costs as described herein shall be excluded from the total tender sum when Clause 13 of General Conditions of Contract is applied."

PSA 8.10 **Accommodating Other Contractors** ..... **Unit : Sum**

The amount tendered shall cover the cost of accommodating civil, electrical and mechanical contractors on the Site of the Works. Payment will be made in equal monthly amounts over the Contract period."

PSA 8.12 **Compliance with The Occupational Health and Safety Act (Act No 85 Of 1993) and Construction Regulations and Specifications Included in the Particular Specifications** ..... **Unit : Sum**

The tendered rate shall include full compensation for compliance with the OHS Act and Construction Regulations and the Health and Safety requirements and specification included in this tender document. Refer to the Annexures in Part C3.11.

It shall further include full compensation for the registration of the project with the Authorities (Department of Labour) and any delay in awaiting for approvals by the Authorities.

Temporary barriers and fences for deep or trench excavations required in terms of the contract shall not be paid for separately.

Payment under this item will be made as follows :

(a) The first instalment which is 30% of the sum tendered, will be paid once the contractors Health and Safety Plan is approved by the Employer or the Employers Agent and the Contractor has met all his obligations to date under this specification.

(b) The remainder of the sum tendered will be paid in equal monthly amounts calculated by dividing the sum tendered (less 30%) divided by the contract period in months.

No additional payment will be made should an extension of the contract period be granted. Penalties for non-compliance will be deducted from payments due to the contractor.

PSA 8.13 **Compliance with The Environmental Management Plan and Requirements Included in the Particular Specifications**..... **Unit : Sum**

The tendered rate shall include full compensation for compliance with the environmental management requirements and specification included in this tender document.

Payment under this item will be made in equal monthly amounts calculated by dividing the sum tendered divided by the contract period in months.

No additional payment will be made should an extension of the contract period be granted. Penalties for non-compliance will be deducted from payments due to the contractor.

PSA 8.17 **Photographic Record**..... **Unit : Sum**

The Contractor must keep a photographic record of the condition of properties and structures within 30 m of the proposed works. Photographs of every structure must be taken prior to construction and must be of high quality (3) mega pixel or higher to ascertain the condition of the property or structure. Structures will include (but are not limited to) boundary walls, fences, road surfaces, kerbing, stormwater structures and the surrounding area along the route of the pipeline. The preconstruction photographs must be handed to the Employer's Agent prior to any excavation is undertaken.

The structures and properties must again be photographed after construction to ascertain any possible damage to the structures or properties due to construction activities. This photographic record must be supplied to the Employer's Agent at the end of the contract and will form part of the record information to be provided by the Contractor.

The tendered sum shall include full compensation for the investigation and supply of the photographic record in electronic and colour hard copy format (standard photo size). Fifty percent of the sum tendered will be payable upon supply and approval by the Employer's Agent of the pre-construction photo record and the remaining 50% upon supply of the post-construction record.

PSA 8.19 Liaison with residents and the local authority .....Unit : Sum

The tendered rate shall include full compensation for all liaisons with the residents of each area and the Municipality regarding valve closures and issuing of public notices.

The municipality must be informed of valve closures affecting residents at least 21 days prior to closing of valves.

The tendered rate must include :

- the preparation of an information page which must be delivered to each household to be affected, prior to working in the area.
- the delivery of a notice informing residents of a disruption in the water supply (14 days prior to the disruption)
- obtaining a "happy letter" from all residents once the work is completed and gardens re-instated.
- direct liaison with residents should a complaint be received including a written account of the complaint and agreement reached with the resident.

No additional payment will be made for additional notices of disruption which must be issued as a result of failed connection attempts."

PSA 8.20 **Record of Test Results and Related Administration** ..... **Unit : Sum**

The tendered rate shall include full compensation for all the requirements stipulated in the particular specifications for the record keeping, updating of test positions, recording the test results in tabular format and providing additional copies with the marked on reference number on a monthly basis.

Upon completion of the contract a separate full set of test results must also be submitted to the Employer's Agent before a Certificate of Practical Completion shall be issued.

Twenty percent of the Time Related P&G amount will be withheld should the required information not be provided in the correct format.

PSC **SITE CLEARANCE (1982)**

PSC 3 **MATERIALS**

PSC 3.1 **Disposal of Material**

Add the following:

"The contractor shall obtain his own dumping sites for the disposal of material and all transport costs shall be included in the rates tendered for site clearance."

PSC 5 **CONSTRUCTION**

PSC 5.1 **Areas to be Cleared and Grubbed**

Add the following:

"Pipeline routes shall be cleared to a distance of 1,5 m on both sides of the pipeline centre line. Route pegs or markers shall not be destroyed or damaged during clearing operations."

PSC 5.2 **Cutting of Trees**

PSC 5.2.3 Preservation of trees

PSC 5.2.3.2 *Individual trees*

Replace the last sentence with the following:

"An amount of ***R500-00*** will be deducted from moneys due to the Contractor as a penalty for every tree that is damaged or removed unnecessarily."

PSC 5.3 **Clearing**

Add the following:

"The tenderers attention is drawn to the fact that all items described under subclause 5.3 which are not separately listed in the bill of quantities must be included in the price for item PSC 8.2.1."

PSC 5.5 **Reclearing of Vegetation**

Add the following:

"Where areas have to be re-cleared on the written instructions of the Employer's Agent, such re-clearing shall be carried out at the contractor's own cost and the contractor is advised therefore, not to clear areas at such an early stage that re-clearing may become necessary."

PSC 8 **MEASUREMENT AND PAYMENT**

PSC 8.1 **Basic Principles**

Add the following:

"Levels to be used for earthworks quantity calculations will be surveyed once the clearing operation have been completed."

PSC 8.2 **Scheduled Items**

PSC 8.2.1 Clear and Grub

Replace the first line with the following:

"The area designated by the Employer's Agent to be cleared and grubbed will be measured in m² to the nearest square metre or,"

PSC 8.2.7 Dismantle and remove pipelines, electricity transmission lines, cables, etc.

Replace the contents of this Subclause with :

"The tendered rates shall include full compensation for the detection, disconnection, removal, stockpiling, safeguarding, reinstatement and reconnection of services, including all necessary excavation, bedding, concrete bases and backfilling.

In the event of the contractor damaging any of the services he will replace it at his own cost".

PSC 8.2.8 Demolish and remove structures / buildings ..... **Unit : Sum**

The contractor shall ascertain the works necessary to remove the structures complete as given in the schedule of quantities and noted on the drawings.

"The rate shall cover the cost of excavating around the structure, demolishing the structure, disposal of excavated material and rubble, and backfilling of the hole with sand in layers of 300 mm including compaction to 100% of MOD AASHTO. There will be distinguished between different structures."

Add the following payment clauses :

"PSC 8.2.11 Remove topsoil to spoil site furnished by contractor .... **Unit : m³**

The tendered rate shall include full compensation for removing topsoil to a depth of 150 mm and for loading and transporting the material to spoil sites furnished by the contractor.

The Contractor shall confirm during the clear and grub and topsoil removal operation, in writing with the Employer's Agent any areas where the topsoil exceeds 150mm depth or where the roots of plant material requires deeper ripping for complete removal. The method and scope of additional work will then be confirmed by the Employer's Agent.

Add the following items to Subclause 8.2 :

"PSC 8.2.13 Take down and re-erect existing fences ..... Unit : m

The rate shall cover the cost of taking down the fences, coiling wire, sorting, stacking and guarding all material, the cost of loading, transporting and off-loading such material, the cost of re-erecting the fence in its original position, or temporary position, using the dismantled material and the cost of temporary bracing the sections of fence not taken down.

The rate shall also cover the cost of using new tying wire but not the cost of any other new material that may have to be used on the written instructions of the Employer's Agent.

PSC 8.2.15 Remove and dispose of kerbing ..... **Unit : m**

The rate shall cover the cost of the removal, transport and disposal of existing kerbs to a spoil site furnished by the Contractor, including all necessary excavation and backfill compacted to 100% modified AASHTO density.

PSC 8.2.17 Rip and clear tarred and paved areas .... **Unit : m²**

Various items shall be scheduled. The rates shall collectively include full compensation to rip, clear and spoil at a spoil site provided by the contractor of asphalt or block paving.

PSC 8.2.18 Remove kerbs, stockpile, store, maintain and reinstate ..... **Unit : m**

The tendered rate shall include full compensation for careful excavation around the kerbs, careful removal, loading, transport of kerbs, off loading, clearing, stacking, storing and maintaining of the kerbs and the reinstatement of kerbs. The rate shall also include full compensation for setting out, kerb mix, planning and finishing of the reinstated kerbs.

Various items shall be measured for various types of kerbs.

PSC 8.2.19 Demolish and remove concrete slab up to 300mm thick ..... **Unit : m²**

The tendered rate shall include full compensation for saw cutting, demolishing and disposing of existing concrete slabs up to 300mm thick.

In the event of the contractor damaging any services or existing infrastructure, he will replace or reinstate it at his own cost

PSC 8.2.20 Dismantle, move and re-erect light poles ..... **Unit : No.**

The tendered rate shall include full compensation for taking down and moving existing light poles and re-erecting the light pole at a location agreed upon with the Client. The rate shall also allow for the protection of the existing light pole during its removal, moving, and re-erecting.

In the event of the contractor damaging the light pole during its removal, moving, and re-erecting he will replace it at his own cost

PSD **EARTHWORKS (1988) AS AMENDED 1990**

PSD 2 **INTERPRETATIONS**

PSD 2.1 **Supporting Specifications**

Replace subclause 2.1.2 with the following:

"PSD 2.1.2 Any of the other SABS 1200 specifications may form part of the contract documents."

PSD 2.3 **Definitions**

Replace the definition "Borrow" with the following:

"Borrow material: Material, other than material obtained from excavations required for the works, obtained from sources such as borrow pits or the authorised widening of excavations. 'Borrow' shall have a corresponding meaning."

Replace the definition "Specified density" with the following:

"Specified density: The specified dry density expressed as a percentage of modified AASHTO dry density."

Replace the definition "Stockpile" with the following:

"Stockpile (Verb): The process of selecting and, as maybe necessary, loading, transporting and off-loading material in a designated area for later use and a specific purpose."

Add the following definitions:

"Fill: An embankment or terrace constructed from material obtained from excavations or borrow. In roads it includes the earthworks up to below the selected sub-grade level.

Fill (material): Material used for the construction of an embankment or terrace.

Roadbed: The in-situ material on which a fill is to be constructed.

Placing : Placing shall mean spreading of backfilling material, watering, mixing, compacting, final grading, complying with the required tolerances and providing for testing, all in accordance with the requirements of the specification."

PSD 3 **MATERIALS**

PSD 3.1 **Classification for Excavation Purposes**

PSD 3.1.1 Method of classifying

Add the following:

"Classification of material other than 'soft excavation' shall be agreed upon before excavation may be commenced. The contractor shall immediately inform the Employer's Agent if and when the nature of the material being excavated changes to the extent that a new classification for further excavation is warranted. Failure on the part of the contractor to advise the Employer's Agent thereof in good time shall entitle the Employer's Agent to classify, at his discretion, such excavation as may have been executed in material of a different nature."

PSD 3.2.3 Material suitable for backfill or fill against structures

Replace the contents of this sub-clause with the following :

"Material used for backfill behind structures shall generally be the material excavated, subject to the following conditions :

(a) The material shall not contain an excessive number of stones retained on a 50 mm sieve; and

(b) The material shall not contain large clay lumps that do not break up under the action of the compaction equipment; and

(c) The liquid limit of the material shall not exceed 40, neither shall the PI exceed 18.

(d) The minimum modified AASHTO density shall be 95%."

PSD 3.3 **Selection**

PSD 3.3.1 General

Replace the second paragraph with the following :

"The Contractor shall deal selectively with materials from all excavations to ensure that no acceptable backfill or bedding material is contaminated by material unfit for use. No additional payment shall be made in this regard and all costs related to the above selection process shall be included in the applicable payment items. Should useful material be contaminated to such an extent that it is regarded as unfit for use the Contractor shall at his own cost dispose of this material and replace it with material of an equivalent standard to the acceptable in-situ material."

Add the following subclause:

PSD 3.3.3 Selection in borrow pits

The approval of a borrow area for a certain purpose does not necessarily mean that all material within the area is suitable for the specified purpose. What it does mean, is that the borrow area contains some suitable material. The onus is on the contractor to ensure that only material that is indeed suitable is removed and used for the specified purpose."

Where the contractor is required to select material from excavations for a specific purpose, the above provisions relating to borrow areas shall apply *mutatus mutandis* to excavations.

The contractor shall not waste or contaminate material that has been elected for a specific purpose.

PSD 4 **PLANT**

PSD 4.4 **Detectors**

Replace the contents of Subclause 4.4 with the following :

"The Contractor shall, for the purposes of detecting and locating underground services in accordance with the provisions of Subclause 5.4 of SABS 1200 A and Subclause 5.1.2 of SABS 1200 D, at its own cost, provide and use detecting equipment which is suitable for the detection of underground cables and pipes."

PSD 5 **CONSTRUCTION**

PSD 5.1 **Precautions**

PSD 5.1.2 Existing services

PSD 5.1.2.2 *Detection, location and exposure*

Replace the contents of subsubclause 5.1.2.2 with the following:

"Where no services are shown on the drawings, but the presence of such a service could be assumed within reason, the Contractor must in co-operation with the relevant authorities locate such a service before commencing construction. After locating such a service, it would be regarded as a noted service, and the Contractor will be responsible for any costs arising from damages to the service due to the construction activities of the contractor."

"The exposure by the Contractor of underground services, as required in terms of Subclause 5.4 of SABS 1200 A (as amended) shall be carried out by careful hand excavation at such positions and to such dimensions as are agreed to by the Employer's Agent.

Unless otherwise instructed or agreed by the Employer's Agent, no service shall be left exposed after its exact position has been determined and all excavations carried out for the purposes of exposing underground services shall be promptly backfilled and compacted to the following densities :

(a) In roadways : 98% Mod AASHTO density ; and

(b) In all other areas : 93% Mod AASHTO density.

Where hand excavations to expose underground services have to be carried out in roadways, the Contractor shall reinstate the road layerworks in accordance with the provisions of Subclause 5.9 of SABS 1200DB.

Payment in respect of the exposing of the services by means of hand excavation as described above, will be made in accordance with Subclause PSD 8.3.8.1.

Payment in respect of the reinstatement of layerworks in roadways will be made in accordance with Subclause 8.3.6.1 of SABS 1200DB (as amended).

PSD 5.1.2.3 *Protection of cables*

REPLACE SUBSUBCLAUSE 5.1.2.3 WITH THE FOLLOWING:

"5.1.2.3 *Protection during Construction*

Further to the requirements of Subclause 5.4.2 of SABS 1200A (as amended), major excavating equipment and other Equipment shall not be operated dangerously close to Known Services. Where necessary, excavation in close proximity to Known Services shall be carefully carried out with suitable hand tools, excluding picks wherever their use could damage the services. No additional payment will apply to such more difficult work.

Should any service not being a Known Service be discovered or encountered during the course of the Contract, the Contractor shall, in addition to complying with the requirements of Subclause 5.4.2 of SABS 1200A (as amended), immediately notify the Employer's Agent thereof and implement such measures as will prevent damage of such service or, if it was damaged in the course of discovery, will prevent and minimise the occurrence of any further damage occurring."

PSD 5.1.3 Stormwater and groundwater

Add the following:

"The contractor shall at the earliest practicable opportunity install the permanent drainage specified or shown on the drawings and shall at his own cost provide such further temporary drainage as may be necessary for the protection of the works, except where other specific items regarding drainage are provided."

PSD 5.2 **Methods and Procedures**

PSD 5.2.2 Excavation

PSD 5.2.2.1 *Excavation for general earthworks and for structures*
Add the following to paragraph (b):

"Where the nature of the material precludes the above procedure, additional excavations shall be made to provide working space for the erection of form work. In general payment will be made for a working width of 600mm, but the contractor may excavate a greater working width at no additional cost to the employer. Excavation for structures shall be measured to vertical planes 0,6m outside the concrete perimeter.

Immediately before any permanent construction is commenced, all loose material shall be removed or thoroughly compacted."

Replace paragraph (e) with the following :

"Where excavations have been carried out below the authorized levels, the contractor shall backfill such excavations to the correct level with approved gravel compacted to 95% of modified AASHTO density or to the density of the surrounding material.

Where excavations for structures in hard material have been carried out, the Employer's Agent may however require the over-excavation to the backfilled with a weak concrete if there is a danger of settlement or differential settlement of the foundations.

Where the sides of excavations against which concrete is to be cast have been over-excavated or have collapsed partially, the contractor shall retrim in the excavations if necessary and, unless other remedial measures are agreed to by the Employer's Agent, shall cast the concrete for the structure, including any additional concrete which may be required as a result of the over-excavation or partial collapse. The cost of the additional concrete or remedial measures shall be for the contractor's account."

PSD 5.2.2.2 *Borrow pits*

Add the following:

"A commercial source shall, for the purposes of this specification, mean a source of material provided by the contractor, not the employer.

Where it is specified that material shall be obtained from commercial sources, the contractor shall be responsible and include in his prices for borrow to fill from commercial sources, for finding a source of suitable material, for making all arrangements for procuring the material with the owner of the source, for the payment of any royalties, charges or damages and, for transporting the material to the site regardless of the distance involved. No payment will be made for the removal of overburden or stockpiling at the commercial source and no extra over payment for excavating in intermediate, hard or boulder material shall apply."

"PSD 5.2.2.3 *Disposal*

Add the following:

"The contractor shall provide the necessary spoil sites and shall make the necessary arrangements with the owner of the site where the material is disposed of and shall include in his rates for all charges in this regard and for transporting the material regardless of the distance involved."

Add the following subclause:

"PSD 5.2.2.4 *Selection and stockpiling*

The approval or designation of a particular borrow area for a particular purpose will not imply that all the material is suitable for the purpose or should be used for that purpose. The contractor shall select suitable material from that source, discard unsuitable material and reserve material for other purposes as necessary. When required and as ordered by the Employer's Agent, material shall be stockpiled for later use when the excavation thereof is unavoidable in order to excavate the material required at the time.

PSD 5.2.3 <u>Placing and Compaction</u>

PSD 5.2.3.1 *Embankments*

Omit "98% in the case of non-cohesive soil" and substitute "100% in the case of non-cohesive soil".

PSD 5.2.4.3 *Grass or other vegetation*
Add the following subclause:

"Hydroseeding

The following materials shall be used in hydroseeding :

(a) Fertiliser

The type of fertiliser to be used shall be 2:3:2 (22 + 2N) and superphosphate.

(b) Grass seed

The following seed mixture at an application rate of not less than 45 kg of seed mixture per hectare, shall be used :

10 kg	Cynodon dactylon
10 kg	Festuca rubra
6 kg	Lolium multiflorum
6 kg	Agrostis tenius
3 kg	Trifolium subterranean
4 kg	Dactylis glomerata
6 kg	Serredella
45 kg	per hectare

Cellulose pulp shall be added to the hydroseeding mix at a rate of 25 kg of pulp per kilolitre of water used, except where otherwise instructed in respect of flat slopes.

Hydroseeding shall be carried out with an approved hydroseeding machine at a rate of application of not less than 45 kg of seed mixture per hectare, unless otherwise specified in the project specifications.

The work shall be executed in May, which falls in the 12-month maintenance period.

Straw stabilisation

One bale of hay per 20 m² shall be rotivated or harrowed into the sand. Harrowing or rotivation shall be done in an east-west direction, i.e. across the direction of the prevailing winds."

PSD 5.2.5 Transport for Earthworks

PSD 5.2.5.2 *Overhaul*

Replace the contents of this subclause with the following:

"No overhaul will be paid under sections 1200 D, 1200 DM, 1200 DK or 1200 DB or any other sections. All transport costs irrespective of distance, source and material must be included in the relevant payment clauses."

PSD 7 **TESTING**

PSD 7.2 **Taking and Testing of Samples**

Replace the contents of this subclause with the following:

"The contractor shall carry out sufficient tests on a regular basis as agreed between him and the Employer's Agent to determine whether the degree of compaction, and, where applicable, the quality of materials used, comply with the specification and shall submit the results of these tests to the Employer's Agent in a form approved by him. The Employer's Agent may likewise carry out such tests.

Testing by the Employer's Agent will not relieve the contractor of his obligations to provide materials and workmanship in accordance with the specifications.

The requirements of the density for a particular lot shall be deemed to be satisfied if at least 75% of the dry-density tests show values equal to or above the specified density and no single value is more than five percentage points below the specified value."

PSD 8 **MEASUREMENT AND PAYMENT**

PSD 8.1 **Basic Principles**

Add the following paragraph :

"PSD 8.1.4 Where backfilling is part of the activities described under a payment clause, the word backfilling includes the supply of the approved backfilling (regardless of the source and distance), as well as the placing of the material as described under subclause PSD 2.3."

PSD 8.1.5 Watering or harrowing of material and allowing it to dry out to obtain optimum moisture content before backfilling and compaction of fill material (whether obtained from site or commercial sources) will not be paid for separately and shall be deemed to be included in the tendered rates for Bulk Excavation or Restricted Excavation.

PSD 8.2 **Computation of Quantities**

PSD 8.2.1(a)(2) Add "or residential houses", after "…. rail embankment".

PSD 8.3 **Scheduled Items**

PSD 8.3.3 Restricted excavation

Add the words "harrowing or drying the material" after the words "….. material separate (where relevant)" in the fourth sentence of paragraph (a).

Add the following sub-sub-item :

" (c) Extra over item 8.3.3 (a) for hand excavation ..... **Unit : m³**

This item shall apply to hand excavation ordered by the Employer's Agent or where the Employer's Agent considers that, owing to circumstances, excavation by mechanical excavators is not practicable. It shall not apply to hand excavation for the purpose of trimming or finishing excavation made by mechanical means.

The tendered rate shall include full compensation for the additional cost of excavating by means of hand tools."

PSD 8.3.4 Importing of Materials

Amend subclause '(a)' as follows:

Delete the words "Extra over for" from the heading. Delete the words "additional to 8.3.2 and 8.3.3" and replace with "of the work and items described in payment items 8.3.2 or 8.3.3 and including the cost of".

PSD 8.3.10 Topsoiling .....**Unit : m³**

Change the unit to "m³" and replace the contents of this item with the following :

"The unit of measurement shall be the cubic metre and the quantity shall be calculated from the authorized dimensions.

The tendered rate shall include for loading the topsoil from stockpiles, transporting it for the free-haul distance, off-loading, spreading, shaping and lightly compacting."

PSD 8.3.16 Extra over items 8.3.2 and 8.3.3 for disposing of spoil material on a site provided by the contractor .....**Unit : m³**

The tendered rate shall include full compensation for the additional cost of providing a spoil site or other means of disposing of surplus spoil material, for transporting the material, regardless of the distance involved, for any charges for taking such material and for all other incidentals necessary to dispose of the spoil material. No overhaul shall apply.

PSD 8.3.19 Compaction of In-situ Material to a depth of 300mm

a) 93% modified AASHTO density ..... **Unit : m²**

The unit of measurement shall be the square metre.

The tendered rate shall include full compensation for scarifying, watering, shaping and compacting the in-situ material to 93% modified AASHTO density to a depth of 300mm."

PSDB **EARTHWORKS (PIPE TRENCHES) (1989(b))**

PSDB 3 **MATERIALS**

PSDB 3.5 **Backfill Materials**

Add the following paragraphs:

"(c) Cement stabilised backfilling

Backfilling shall be stabilised with 5% cement where directed by the Employer's Agent. Aggregate shall consist of approved soil or gravel containing stones not bigger than 38 mm and with a plasticity index not exceeding 10.

The soil or gravel shall be mixed with 5% cement and shall be compacted in layers of 100 mm thick to 90% of modified AASHTO density.

(d) Soilcrete backfilling

Aggregate for soilcrete shall be mixed with 5% cement and shall consist of approved soil or gravel containing stones not bigger than 38 mm and with a plasticity index not exceeding 10.

The soil or gravel shall be mixed in a concrete mixer with the cement and enough water to such a consistency that the mixture can be placed with vibrators to fill all voids between the pipe and the sides of the trench. Shuttering shall be used where necessary."

PSDB 3.7 **Selection**

Replace the words "if he so wishes" in the first line of the second paragraph with the words "at his own cost".

PSDB 4 **PLANT**

PSDB 4.1 **Excavation Equipment**

Add the following paragraph :

"All excavations in excess of the specified depth and width, must be backfilled with approved backfilling material. No additional payment regarding this will be made, it will be assumed that payment is included in the tendered rates for the applicable items.

Compaction of sand must be to 100% of modified AASHTO maximum density."

PSDB 5 **CONSTRUCTION**

PSDB 5.1 **Precautions**

PSDB 5.1.3 Accommodation of traffic and access to properties

Replace the semicolon and the word "and" at the end of subclause 5.1.3(a) with a full stop and replace item (b) with the following :

"(b) Where necessary to achieve compliance by the Contractor with his obligations in terms of subclause PS 8.1 of Portion 1 Specifications to provide and maintain pedestrian and vehicular access to properties affected by the works, the Contractor shall construct and maintain to the satisfaction of the Employer's Agent, such temporary access roads around, and/or steel or timber bridges over excavations in roads, pavements, entrances or accesses to properties.

Temporary pedestrian access bridges shall be at least 1,2 m wide and temporary access bridges for vehicles shall be at least 3,6 m wide. All temporary access bridges shall be fitted with handrails as well as protective mesh fencing on both sides.

On completion of the work, the Contractor shall dismantle and remove all such temporary constructions and reinstate these areas to their former condition.

Except only where the Employer's Agent has included in the Schedule of Quantities, particular payment items specifically therefore, the Contractor will not be paid directly for the construction and maintenance of temporary access roads and/or the provision and maintenance of bridges as aforementioned, and the costs thereof shall be deemed included in the Contractor's tendered rates for excavation."

Add the following :

"PSDB 5.1.5 Removal Of Existing Pipelines

Where existing pipes have to be removed, they shall be carefully opened up by machine excavation to 300 mm above the pipes after which the whole pipe shall be fully exposed by means of hand excavation. The excavation width shall comply with Subclause 8.2.3.

The pipes shall be removed from the trench in a manner approved by the Employer's Agent, and brought to the surface for inspection by the Employer's Agent.

Pipes that are declared suitable for re-use and pipes declared unfit for re-use shall be dealt with in accordance with the respective manner described in the specifications, or on the drawings or the Employer's Agent's instructions, as relevant."

PSDB 5.2 **Minimum Base Widths**

Add the following above the table.

"No allowance shall be made for the extra thickness of the collars or couplings."

Add the following after paragraph (b) :

"The above is not applicable to trenches for subsurface drains.

Trenches for subsurface drains shall be excavated to the dimensions and gradients shown on the drawings or directed by the Employer's Agent."

PSDB 5.4 **Excavation**

Add the following :

"All excavation for pipes must be done according to the trench excavation method, and not to the fill method. No additional payment extra over to that listed under item 8.3.3 will be made for pipes, culverts or any other structure that falls within the road or fill layers. Except where otherwise specified, trenches shall be of such a depth that the minimum cover over the pipes shall be 700 mm except at road-crossings where the minimum cover shall be 1 000 mm."

PSDB 5.6 **Backfilling**

PSDB 5.6.3 Disposal of soft Excavation Material

Replace the contents of the subclause with the following:

"Excavated material from the trench that has become surplus because of bulking, displacement by the pipe, and importation, shall be disposed of outside the site boundaries at a spoil site provided by the contractor. No additional payment will be made and all costs related to the disposal of this surplus or unsuitable material will be deemed to be included in the tendered rates for the applicable items."

PSDB 5.7 **Compaction**

PSDB 5.7.1 Areas not Subject to Traffic Loads

Replace "90%" with "95%".

Add the following sentence:-

"All non-cohesive material shall be compacted to 100% MOD AASHTO density."

PSDB 5.7.2 Areas Subject to Traffic Loads:

Replace “93%” with “95%”.

Delete "98%" and substitute "100%".
Add the following :

“All pipe trenches that fall within the road reserves shall be regarded as areas subject to traffic loads.”

“PSDB 5.11 **Removal of Existing Pipes**

PSDB 5.11.1 Where shown on the drawings or where so instructed by the Employer’s Agent, the Contractor shall excavate, expose and remove from the ground, existing water pipelines.

PSDB 5.11.2 If so instructed by the Employer’s Agent, the Contractor shall, before commencing with the excavation of the pipeline, expose the pipeline to be removed by means of careful hand excavation at positions agreed with the Employer’s Agent, in accordance with the requirements of Subclause PSA 5.4.1 of Portion 1 of the Project Specifications. Measurement and payment for locating the exact positions of the pipelines where required by the Employer’s Agent, shall be made in accordance with and under Item PSD 8.3.8.1.

PSDB 5.11.3 Thereafter, the existing pipelines to be removed shall be carefully opened up by machine excavation to a depth of not more than 300 mm above the pipes after which the whole pipeline shall be fully exposed by means of careful hand excavation. The excavation width shall comply with Subclause 5.2.

PSDB 5.11.4 The pipes and all specials encountered (e.g. bends, valves, valve box covers and the like) shall be removed from the trench in a manner as to avoid causing damage and as approved by the Employer’s Agent, cleaned sufficiently as to allow inspection of the pipes and specials by the Employer’s Agent and stacked in such a manner as will facilitate the inspection of each pipe and special by the Employer’s Agent.

PSDB 5.11.5 Pipes and specials that are declared by the Employer’s Agent as suitable for re-use shall be transported to the Employer’s storeyard; where it shall be off-loaded and neatly stacked to the satisfaction of the Employer’s Agent and in accordance to the manufacturer’s instructions. The Contractor shall be responsible for obtaining a written receipt of all pipes so delivered to the Employer’s storeyard.

PSDB 5.11.6 Pipes and specials which are declared by the Employer’s Agent as unsuitable for re-use shall be transported to a spoil site and covered with spoil material to a depth of not less than 300 mm.

PSDB 5.11.7 After removal of the pipelines, the trenches shall be backfilled using the excavated material and compacted to 90% Mod AASHTO density. The provisions of Subclauses 5.6. and 5.7 shall apply."

PSDB 8 **MEASUREMENT AND PAYMENT**

PSDB 8.1 **Basic Principles**

PSDB 8.1.1 Replace the last section of subclause 8.1.1 ".... surplus material along the route of the pipeline within 0,5 km of the source", with ".... surplus material within the freehaul distance of the site boundaries."

PSDB 8.1.2 Add the following:

"In the road prism the ground surface from which depth will be measured will always (irrespective of operation sequenced) be the road bed level at centre-line."

PSDB 8.2 **Computation of Quantities**

PSDB 8.2.3 Add the following to subclause 8.2.3.

“Where two or more pipes/ducts are to be placed in one trench, the specified base width shall be calculated as follows:

The trench width for the deeper service shall be calculated according to above specifications. The effective trench width for the shallower service shall then be the difference between its specified base width and the overlap with the trench width of the deeper service.

The trench width for subsurface drains shall be as shown on the drawings."

PSDB 8.3 **Scheduled Items**

PSDB 8.3.2 Excavation

(a) Excavate in all materials for trenches, backfill, compact and dispose of surplus material.

Replace "of 1, 0 m" in the first sentence of 8.3.2 (a) with "as scheduled in the schedule of quantities."

Replace the words "measured to the bottom of the bedding layer" with "measured from the final road layer or surface to the pipe invert level".

Replace the phrase "within freehaul distances"
with:

"at a spoil site provided by the contractor or municipal dumpsite unless scheduled otherwise"
Add the following after the last sentence and before paragraph (b).

"The tendered rate for excavation of trenches for electrical cables to be supplied and installed by the Electrical Contractor shall include full compensation for liaising with the Electrical Contractor, maintaining the trenches to allow the installation of the cables, supply and installation of warning tape and backfilling once the Electrical Contractor completed the installation of cables."

Add the following after the third paragraph :

"The rate shall also cover the cost of the additional compactive effort required as specified in 5.7.2 (as amended) and the additional selection of materials as specified in 5.6.2 to comply with the requirements for areas subject to road traffic loads. No additional payment will therefor be made under item 8.3.3.3."

(b) Extra-over item (a) above for; and (c) excavate and dispose of unsuitable material from trench bottom

Replace the phrase "within freehaul distances"
with:

"at a spoil site provided by the contractor or municipal dumpsite unless scheduled otherwise"

PSDB 8.3.2 (b) Extra over item (a) for :

Add the following at the end of the existing sub-item 2 :

"No payments will be made under sub-items (1) and (2) in respect of any materials measured and paid for under sub-item 3 below."

And add the following new sub-items in 8.3.2(b) :

"(3) Hand excavation and backfill where ordered by the Employer's Agent :

(a) Soft material .....**Unit : m³**
(b) Intermediate material .....**Unit : m³**

The unit of measurement shall be the cubic metre of material, measured in place according to the authorised dimensions, or the lesser dimension excavated, which was excavated by hand on the specific prior written instructions of the Employer's Agent; provided always that the Employer's Agent's said instruction shall have stated that measurement and payment for such hand excavation will be in accordance with this item.

The tendered rate shall include full compensation for the additional cost, effort and time resulting from excavating in the respective materials using hand methods only.

The Employer's Agent shall not be obliged to authorise payment under this item in respect of any hand excavation carried out (whether ordered in writing or otherwise), which hand excavation was in any case necessary to achieve compliance by the Contractor of his obligations under the Contract to :

(i) utilise construction appropriate to the nature of the specific parts of the Work and /or

(ii) protect existing structures and/or services; and/or

(iii) comply with all prevailing legislation and regulations.

(4) Backfill stabilised with 5% cement where directed by the Employer's Agent .....**Unit : m³**

The unit of measurement shall be the cubic metre of backfill material, measured in place after compaction according to the authorised dimensions, which was stabilised on the Employer's Agent's instructions in accordance with Sub-clause PSDB 3.5(c).

The tendered rate shall include full compensation for supplying the cement and for selecting, mixing, backfilling and compacting the stabilised material to 90% of modified AASHTO density.

(5) Soilcrete backfill where directed by the Employer's Agent ..... **Unit : m³**

The unit of measurement shall be the cubic metre of soilcrete placed on the Employer's Agent's instruction in accordance with Sub-clause PSDB 3.5(b), measured in place according to the authorised dimensions.

The tendered rate shall include full compensation for supplying the cement and for selecting, mixing and placing the soilcrete as well as for the cost of shuttering if required.

(6) Mass concrete Class 15 MPa/19mm in encasing around pipes where directed by the Employer's Agent ....**Unit : m³**

The unit will be the cubic metre as measured in Item 8.3.2 for the applicable material.

The rate will make full provision for the excavation, backfilling, vibrating and compacting as applicable.

The tendered rates for subitem (6) shall include full compensation for supplying the cement and for selecting, mixing and placing the soilcrete or mass concrete, as well as for the cost of shuttering if required.

(7) Excavation is marshy areas irrespective of depth .....**Unit : m³**

The unit will be the cubic metre as measured in Item 8.3.2 for the applicable material.

The rate will make full provision for the excavation, backfilling, vibrating and compacting as applicable.

The tendered rate for subitem (7) shall include full compensation for all additional costs as a result of excavating in marshy areas, for pumping and draining if required and for vibrating and compacting to the specified density.

(8) Backfill with clean sand compacted to 100% modified AASHTO density .....**Unit : m³**

The unit will be the cubic metre as measured in Item 8.3.2 for the applicable material.

The rate will make full provision for the excavation, backfilling, vibrating and compacting as applicable.

The tendered rate for subitem (8) shall include full compensation for all additional cost to dispose of excess excavated material at a spoil site provided by the Contractor and to import clean sand from commercial sources to backfill and to compact the clean sand backfill to 100% Mod AAHSTO.

(9) Boulder Excavation

The unit of measurement shall be the cubic metre of boulder material excavated.
(Refer to SANS 1200D, 3.1.2d)

Add the following sub-items in 8.3.2 after sub-item 8.3.2) (c) :

(10) Excavate in all materials for stormwater inlet and outlet structures and for manholes, catchpits, valve chambers and the like, irrespective of depth and backfill around structures .....**Unit : m³**

The unit of measurement shall be the cubic metre of material excavated, measured in place according to the authorised dimensions, and excluding the volume of material excavated and paid for under sub-item (a).

The tendered rate shall include for the costs of excavating in all materials, backfilling, compacting, trimming and tidying of the final surface around the structure, disposing of surplus and unsuitable materials within the freehaul distance and where applicable, selecting and keeping separate, excavated material suitable for use as backfill.

(11) Excavate open drains in all materials .....**Unit : m³**

The tendered rates shall include full compensation for excavating in all materials within the dimensions specified or authorised by the Employer's Agent and to the specified lines and profiles, for the disposal of surplus and unsuitable excavated material where applicable, and in the case of item (d), for backfilling with suitable approved material compacted to 93% of modified AASHTO density around the structures.

(12) Extra-over sub-items (10) and (11) for excavating in :

(1) Intermediate material.....**Unit : m³**

(2) Hard rock material .....**Unit : m³**

Measurement and payment shall be in accordance with the provisions of 8.3.2(b) of SABS 1200D (as amended)."

PSDB 8.3.3 Excavation ancillaries

PSDB 8.3.3.1 Add the following to the last paragraph :

"The freehaul distance is unlimited and no additional payment will be made for the transport of the material".

PSDB 8.3.3.3 Compaction in road reserves

Replace the heading of this subitem with the following :

"PSDB 8.3.3.3 Compaction in road crossings"

And replace the sentence "The volume will be measured as specified in 8.2.2, 8.2.3 and 8.3.3.1" *with the following :*

"In the case of gravel roads, determining the volume, the depth will be measured from the underside of the gravel wearing course to the top of the fill blanket, and in the case of bitumen roads, from the underside of the subbase to the top of the fill blanket, unless a selected layer is specified then it will be measured from the bottom of the selected layer. The length of the trench used for compacting the quantity for payment will be the actual length under the road."

The rest of the trench shall be backfilled as specified in Clauses 5.9.3, 5.9.4 and 5.9.5, as applicable, and payment will be made under item 8.3.6.1."

PSDB 8.3.4 Particular Items

PSDB 8.3.4(a) Shore trench opposite structure or service

Replace the heading of this subitem with the following :

"PSDB 8.3.4(a) Shore trench opposite structure or service or in restricted work space

Add 'of the approved design, presentation of method statement' after 'if necessary', in the second sentence.

"Add the following after the last sentence :

The Contractor shall be responsible for the design of all lateral support and shoring. Designs certified by a Registered Professional Engineer including all design assumptions, calculations, drawings and method statements must be submitted to the Employer's Agent for acceptance prior to ordering material and prior to any excavation work commences.

Add the following after the last sentence :

"Separate items will be measured for depths of trenches in increments of 1,0m. The rate for each stated category shall cover the cost of shoring from ground level up to the full depth of the stated category, both sides of the trench. Payment for this item will only be made if written instructions were issued by the Employer's Agent."

PSDB 8.3.5 Existing services that intersect or adjoin a pipe trench

PSDB 8.3.5(b) Services that adjoin a trench

Replace the last phrase "measuring for shoring" with the words "protected by shoring". The rate for this item shall cover the cost of any necessary shoring.

Add the following :

"(v) This rate shall also cover the additional cost of detection, exposure, hand excavation, protection, alteration and backfill material (the last if outside trench dimensions).

(vi) An existing service which has been abandoned at the time it is crossed, will not be measured.

PSDB 8.3.6 Finishing

PSDB 8.3.6.1 Reinstate road surfaces complete with all courses ..... Unit : m²

Add the following :

(a) Paved Roads

The courses shall consist of 80 mm concrete interlocking paver on 20mm sand, on 150 mm thick G3 base to 98% Mod AASHTO, on 150 mm thick G5 subbase to 97% Mod AASHTO on 300 mm sand to 100% Mod AASHTO.

(b) Asphalt Roads

The courses shall consist of 35 mm Asphalt on MC-30 bitumen on 150 mm thick G4 base to 98% Mod AASHTO, on 150 mm thick G5 subbase to 97% Mod AASHTO on 300mm sand to 100% Mod AASHTO.

The tendered rate shall also include the application of a joint sealer, Viaseal or equivalent for all joints in the asphalt.

Where hot premix can not be obtained, road crossings shall be reinstated in accordance with the following.

Tosas Pothole Patch water resistant hot mixed cold bagged premix; or similar proven and approved

Product to satisfy :

- ***Grading as per COLTO Table 4202/7 for medium continuously graded asphalt***
- ***With a typical active filter content of 1%, and***
- ***base bitumen as per Clause 4202 (a) (1).***
- ***Binder content between 4,8 and 5,8% by mass and specifically formulated binder additive 0,008 to 0,009% by mass (the lower value for hot conditions and higher value for cold conditions)***
- ***Voids in mix 3,0 to 5,0***
- ***Marshall properties :***
  - ***Stability (kN)8,0 to 16,0;***
  - ***Flow (mm) 2 to 14;***
  - ***Immersion Index (%) 75(min)***
- ***All weather application possible in case of emergency, but ambient temperature should be 20 degrees centigrade and rising.***

(c) Gravel roads

The course shall consist of 150 mm G5 subbase compacted to 97% Mod AASHTO on 300 mm sand to 100% Mod Aashto.

(d) Paved driveways

The courses shall consist of 60mm thick new brick paving of similar colour (no broken bricks) to the existing paving, on 20mm clean sand, on 150mm G5 subbase to 97% Mod AASHTO on 300mm of clean sand to compacted 100% Mod AASHTO. The tendered rate shall also include for all cutting of pavers.

(e) "Crazy Pave"

The courses shall consist of half bricks placed in a similar pattern to the existing paving with a sand cement (ratio 1 to 3) for the infill between bricks on 150mm G5 subbase compacted to 97% Mod AASHTO on 300mm of clean sand compacted to 100% Mod AASHTO.

(f) Concrete drive way

The courses shall consist of a 125mm Class 25MPa/19mm concrete on 150mm G5 subbase compacted to 97% Mod AASHTO on 300mm of clean sand compacted to 100% Mod AASHTO.

(g) Premix sidewalks

The courses shall consist of 30m premix on 125mm G5 subbase compacted to 98% Mod AAHTO, on 200mm clean sand compacted to 100% Mod AASTO.

PSDB 8.3.16 Compaction of trench invert in situ material to a depth of 300mm..... **Unit : m³**

(a) 93% modified AASHTO density

The unit of measurement shall be the cubic metre compacted, 300mm deep across the authorized trench width.

The tendered rate shall include full compensation for scarifying (if necessary), watering, shaping and comparing the in situ material to 93% Mod AASHTO density to a depth of 300mm below the trench invert.

PSDB 8.3.17 Testing of trench related works..... **Unit No**

Various test methods and materials to be tested shall be scheduled and only additional tests ordered by the Employer's Agent and which indicate compliant materials and workmanship will be paid for. Apart from DCP tests witnessed by the Employer's Agent all other tests must be undertaken by a registered independent laboratory. DCP tests shall be undertaken to a depth of 0,3m below the invert of the trench or the depth of the layer thickness being tested unless scheduled otherwise.

Tests results shall be tabulated in electronic format with a unique reference number, the position shall be indicated and the test results clearly referenced to the requirements.

PSG **CONCRETE (STRUCTURAL)**

PSG 2 **INTERPREATATIONS**

PSG 2.4 **Explanation of Terms**

Add the following:

"PSG 2.4.4 Precast concrete

Concrete components of the general quality described in this specification, which have been cast and cured either elsewhere or on the site and placed in position to form an integral part of the structure."

PSG 3 **MATERIALS**

PSG 3.2 **Cement**

PSG 3.2.2 Alternative types of cement

Replace the contents of this subclause with the following:

"Only ordinary Portland cement, CEM 1 42,5 according to SABS ENV 197-1, may be used.

Should the contractor wish to use any other type of cement he shall obtain the Employer's Agent's prior written approval (see 8.1.3.2 and 8.1.3.3). "

PSG 3.2.3 Storage of cement

Add the following:

"Cement shall not be stored for longer than 12 weeks without the permission of the Employer's Agent."

PSG 3.4 **Aggregates**

PSG 3.4.3 Storage of aggregates

Add the following:

"Where aggregates of differing chloride content are stored on the site, the use thereof in the various classes of concrete, shall be strictly controlled."

Add the following subclauses:

"PSG 3.9 **Waterstops**

PVC waterstops shall comply with the requirements of CKS 389."

PSG 3.10 **Roofing Felt**

Three-ply roofing felt shall comply with the requirements of SABS 92 for type 40 felt.

PSG 3.11 **Butyl Rubber Sealing Strips**

The dimensions of the sealing strip for use in the reservoir are shown on the drawings. The strips shall have a factory-applied bonding layer on one side.

The strip shall have an elongation at break of not less than 300% and a tensile strength of 8,0 MPa. The sealing strip shall be permanently bonded to the prepared concrete surface, in accordance with the manufacturer's instructions.

The completed joint shall be guaranteed to be 100% watertight and to be resistant to the long term effects of chemically treated water.

PSG 3.12 Alkali-Aggregate Reaction

Malmesbury hornfels (shale) or other potentially reactive aggregate shall not be used in conjunction with a high alkali cement in concrete in any part of the Works. For the purposes of this clause, a high alkali cement is one in which the equivalent alkali content (Na_2 O equivalent) exceeds 0,60% by mass of cement.

In order to ensure that the above requirement is met, the Contractor may elect to use a non-reactive aggregate, that complies with the requirements of SABS 1083. Alternatively, if the Contractor chooses to use Malmesbury hornfels or other potentially reactive aggregate, he shall comply with the following requirements regarding the cement:

a) Before commencing any particular section of the structure, the Contractor shall ensure that he has enough cement that is not a high alkali cement to complete the section.

b) Certificates stating the alkali content of each delivery of cement to the Site shall be supplied by the Contractor. These certificates shall be based on tests carried out at a laboratory approved by the Employer's Agent. The cost of testing, including sampling, transporting of samples, and issuing of certificates, shall be borne by the Contractor.

c) The Contractor shall be entitled to use an approved brand of cement as a means for ensuring that the permissible alkali content is not exceeded. The Contractor shall make allowance for the higher price of such brand, if he chooses to use this method.

d) High alkali cement delivered to the Site shall be rejected, and the cost of its removal and replacement with cement with an acceptable alkali content shall be borne by the Contractor.

PSG 4 PLANT

PSG 4.1 **General**

Add the following subclause:

"PSG 4.1.1 Minimum plant

The contractor shall have available and in sound working order the following minimum plant for the construction of the concrete structures:

(a) Two concrete mixers each of sufficient capacity to complete a circumferential section of the walls between horizontal construction joints within 4 hours and without interruption.

(b) Two weigh batchers to supply the mixers.

(c) Four concrete vibrators of which at least one shall be powered by an internal combustion engine.

(d) One air compressor.

(e) Suitable and adequate plant to transport and raise concrete and other material and equipment from the ground level to the top of the structure at all stages of construction.

(f) Elevated storage tanks of adequate capacity to ensure that sufficient water will be available before the commencement of every major concrete-placing operation.

Should the plant used for placing concrete be electrically or mechanically powered, then he shall also provide some other approved, non-electrically powered standby means for the placing of concrete at an adequate rate in the event of a power or mechanical failure of the main plant.

Where applicable, where the contractor elects to place a crane inside the circumference of the reservoir wall for the duration of the period of construction, he shall communicate with the Employer's Agent in good time to ensure that the design and layout of the panels which form the roof slab and floor allow for such positioning of the crane. Where sections of the roof and floor have to be redesigned to accommodate the crane, the costs of such redesign shall be borne by the contractor."

PSG 4.5 Formwork

PSG 4.5.1 Design

Add the following:

"Any or all formwork or scaffolding required for any part of the works shall be designed by the contractor, and before commencing with the erection of any formwork or scaffolding, the contractor shall submit to the Employer's Agent, for approval, the methods which he proposes to use. The Employer's Agent shall have the authority to order any alterations to the design or in the sizes of any part of the formwork or scaffolding which he may consider necessary. The fact that the Employer's Agent approved or has altered any part shall not be construed as to relieve the contractor of his responsibility with regard to the strength and stability of the formwork or scaffolding."

PSG 4.5.3 Ties

Add the following:

"No plugs, bolts, ties or clamps of any description used for the purpose of holding the formwork will be allowed to project into or through the concrete unless with the express permission of the Employer's Agent.

Only approved tie-rods which consist of solid rods (which remain embedded in the concrete) and have removable ends shall be used to hold the formwork of the reservoir walls. The removable tie-rod ends shall be such that they can be removed without damaging the concrete, and no permanently embedded parts of such tie-rods shall have less than 50 mm cover to the finished concrete surface.

The cavities left in the concrete after the tie-rod end cones have been removed shall be soundly caulked with cement mortar to which an approved shrinkage-reducing agent has been added, and shall be neatly finished to a smooth surface uniform with that of the surrounding concrete.

The cost of supplying the special tie-rods as well as filling the cavities left by the tie-rod cones shall be included in the rates tendered for formwork under the appropriate pay items.

On no account shall formwork be secured to reinforcing bars."

PSG 5 **CONSTRUCTION**

PSG 5.1 Reinforcement

PSG 5.1.2 Fixing

Add the following:

"The Employer's Agent will inspect the reinforcing after it has been fixed in place, the formwork has been cleaned, cover blocks have been positioned, and before concreting commences. Welding of reinforcing steel will not be permitted."

PSG 5.1.3 Cover

Add the following:

"The distance between pipes cast into the concrete and the reinforcing shall nowhere be less than:

(a) 40 mm or

(h) 5 mm plus the maximum size of the coarse aggregate, whichever is the largest."

Add the following:

"PSG 5.2.5.6 The Contractor shall make provision for the continued support of beams and slabs while the formwork is being removed and/or for back-propping of beams, slabs, etc. The propping may be required simultaneously on more than one level directly underneath one another. The requirements for continuous propping and/or backpropping shall be calculated to a theoretical model that is acceptable to the Employer's Agent, and details shall be submitted for the Employer's Agent's approval. Data required for such calculations, eg design loads and structural dimensions, will be supplied by the Employer's Agent on request."

PSG 5.3 Holes, Chases and Fixing Blocks

Add the following:

"Cover blocks for reinforcing and fixtures may be cast into the concrete provided the strength or any other desirable characteristic (such as the appearance) of the concrete section is, in the opinion of the Employer's Agent, not affected or impaired."

PSG 5.5 **Concrete**

PSG 5.5.1.5 *Durability*

The exposure conditions for concrete are classified as "very severe".

Add the following values to table 5 :

"The maximum water/cement ratio for moderate sections, general reinforced concrete, exterior portions of mass concrete, as well as for internal concrete in buildings under conditions of very severe exposure, is 0,45".

Notwithstanding the aforementioned, the cement content may under no circumstances be less than :

Structural concrete of $\geq$ 25 MPa - 265 kg/m^3
Exposed concrete and trafficable surfaces - 280 kg/m^3

PSG 5.5.1.7 *Strength Concrete*

Add the following:

"The concrete mixes shall be designed by the Portland Cement Institute or similar approved laboratory.

The shrinkage of concrete to be cast in floor systems, shall not exceed 0,02 % tested as per SABS 1085. Three tests shall be conducted on the mix design to confirm compliance. Test results shall be made available before the concrete is used on site."

PSG 5.5.3.2 *Ready-mixed concrete*

Add the following:

"The Contractor shall confirm that sufficient continuous supply of concrete is secured to complete the portion of concrete work in one continuous pour."

PSG 5.5.7 Construction joints

Add the following:

"Horizontal construction joints are permitted in the walls, but must be clarified with the Employer's Agent in advance."

The wall shall be cast in lifts of such height that each lift can be poured without interruption in one continuous operation during normal working hours.

A payment item is provided to cover the costs (if any) of ensuring the watertightness of construction joints. It is the contractor's responsibility to ensure that such joints are watertight. The contractor's proposed method for ensuring the watertightness of such joints shall be submitted to the Employer's Agent for his approval."

PSG 5.5.8 Curing and protection

Add the following:

"Should a curing compound be allowed by the Employer's Agent then it shall be a resin based curing compound. Curing of columns, shafts and walls shall be done by either retaining the formwork for the required period of time or covering with plastic sheeting. On lesser shafts and walls the Employer's Agent may allow a curing compound for curing."

PSG 5.5.11 *Watertight concrete*

Add the following:

"The minimum cement content for OPC in water-retaining structures shall be 325 kg/m3, while the maximum shall be 400 kg/m3 in reinforced concrete, or 500 kg/m3 in prestressed concrete. Where OPC blended with PFA is permitted, the maximum cement content shall be 450 kg/m3 for reinforced concrete, and 550 kg/m3 for prestressed concrete.

The maximum water:cement ratio for water-retaining structures shall be 0,53 for OPC. Where XYPEX admix is specified the following shall apply:

XYPEX ADMIX C500NF for the readymix concrete : XYPEX 500

- Dosage to be at 1% by weight of Total Cementitious Material (including extenders) – generally min 3kg/m³
- W/C Ratio to be below 0.60

PSG 6 TOLERANCES

PSG 6.2 **Permissible Deviations**

PSG 6.2.3 Specified permissible deviations

Add the following:

"Degree of accuracy II is applicable.

Every permissible deviation is binding on its own. The accumulative effect of permissible deviations will not be considered. The maximum permissible vertical deviation is subject to the other permissible deviations."

Replace subclause 6.2.3(d)(5) with the following:

	Permissible deviation Degree of accuracy		
	III	II	I
	mm	mm	mm
"Vertically, per metre height	5	3	2
subject to a maximum of	50	30	10

None of the prescribed permissible deviations will be taken as permission for violating any legal boundaries of properties by any part of a structure.

The above permissible deviations also apply to slip-form concrete, unless another set of permissible deviations have first been accepted by the Employer's Agent, in writing. Such amended permissible deviations shall clearly make provision for interfaces between structures erected with the aid of slip-form concrete and those erected with the aid of conventional concrete.

The maximum permissible deviation from a 3 m long straight line connecting two points on the surface of a finished floor is 5 mm."

PSG 7 TESTS

PSG 7.1 Facilities And Frequency Of Sampling

PSG 7.1.1 Facilities

Add the following:

"The contractor shall provide the facilities necessary to test the concrete cubes made at the frequency specified in subclause 7.1.2.

The facilities shall consist of sufficient storage capacity and the testing of cubes:

(a) by means of an approved, calibrated cube testing press installed on site in a manner approved by the Employer's Agent, or

(b) by an approved laboratory.

The cost of all testing including the cost of sampling, storage and transport of samples shall be included in the rates tendered for concrete work."

PSG 7.3 Acceptance Criteria for Strength Concrete

Add the following:

"Test results obtained from the supplier of ready-mixed concrete will not be accepted for evaluation in terms of subclause 7.3 but samples for testing shall be taken of such concrete at the point of placing."

Add the following acceptance test for watertightness of the tank:

"TESTING FOR WATERTIGHTNESS

The structure shall be filled with water being gradually let in until the top water level has been reached. The water level will then be carefully noted and recorded by the Employer's Agent in relation to a fixed bench-mark, and the structure shall be allowed to remain filled for a period of two weeks to permit complete absorption of water by the concrete. This period may be shorter should an earlier test prove to be successful.

Any loss of water which may have occurred shall then be made up by again filling the structure to the top water level and by allowing to be watertight if the drop in level in 96 hours (less the drop caused by evaporation) does to represent more than 0,06% of the volume of the structure.

The evaporation shall be measured by the mean drop in level caused by the evaporation of the water in three flat containers floating in the water, being recorded.

The contractor may attend the taking of all measurements by the Employer's Agent.

In the event of an appreciable leakage being evident or visible at any stage of the filling or testing, or in the event of the final degree of watertightness being unsatisfactory, the contractor shall, when so ordered by the Employer's Agent, discontinue such filling or testing and shall, at his own expense, take approved steps to rectify the leakage, until a test proves that a sufficient degree of watertightness has been obtained.

The costs of retesting the structure for watertightness shall be borne by the contractor."

PSG 8 **MEASUREMENT AND PAYMENT**

PSG 8.3 Measurement and Rates

PSG 8.3.1 & PSG 8.3.2 Reinforcement

Replace the contents of this subclause with the following:

"The unit of measurement for steel bars shall be the ton of reinforcement in place in accordance with the drawings or as authorized by the Employer's Agent.

The unit of measurement for welded steel fabric shall be the kilogram of fabric reinforcement in place and the quantity shall be calculated from the netto area covered by the mesh, excluding laps.

Clips, ties, separators, stools and other steel used for positioning reinforcement shall not be measured, unless shown on the bending schedules.

The tendered rate shall include full compensation for the supply, delivery, cutting, bending, welding, placing and fixing of the steel reinforcement, including all tying wire, stools, supports and waste."

PSG 8.10 **Testing for water tightness** ..... **Unit : No**

Various structures will be scheduled. The rate will include full compensation for the successful water tightness test in accordance with PSG 7.3.

The water tightness test will be paid by a lump sum separately for each structure.

The tendered sum shall make full compensation for all labour, equipment, water and materials to carry out the tests as specified in PSG 7.3, to rectify faults and to achieve a test result to the satisfaction of the Engineer.

The sum shall include for all water required for the successful watertight testing of the structure.

PSG 8.11 **Brickwork and Plasterworks** ..... **Unit : m^2**

Building work shall be carried out in accordance with SANS 10400 and the specification and drawings.

8.11.1 Bricks

Bricks shall comply with SABS 227 and shall be of the class scheduled or shown on the Drawings.

Satisfactory proof of the load-bearing capacity of the bricks offered shall be submitted before deliveries are made to the Site.

Three samples of each type of brick shall be submitted to the Employer's Agent for approval. All subsequent deliveries shall be of a standard equal to or better than that of the approved samples.

Wall ties shall be of the galvanised, crimped, single-wire type with a 3,5 mm diameter, and shall comply with the requirements of SABS 28.

8.11.2 Construction of Brickwork and Plasterwork

8.11.2(a) Cement mortar

Cement mortar shall, unless otherwise specified, consist of 1 part of Portland cement to 4 parts of sand by volume for normal brickwork and 1 part of Portland cement to 3 parts of sand by volume for reinforced brickwork. The ingredients for cement mortar shall be measured in proper gauge boxes on a boarded platform and thoroughly mixed. Alternatively, mixing may be by means of an approved mechanical batch mixer. Only when the dry ingredients have been thoroughly mixed and a mixture of uniform colour has been obtained may the water be added in sufficient quantity to obtain mortar with the required consistency.

Cement mortar shall be used within two hours of adding water to the mix and shall not be used after two hours or if it has begun to set. Mortar shall be turned over frequently until it is used to prevent it from setting.

8.11.2(b) Brickwork

Dimensions of all the brickwork shall be set out and built as shown on the Drawings. Bricks shall be kept wet before laying and the top of brickwork shall be wetted before any further bricks are laid. Bricks shall be well buttered with mortar before being laid and all joints shall be thoroughly flushed up as the work proceeds. All joints to face brickwork shall be neatly made and key drawn with a 6 mm key.

Brickwork shall be carried up in a uniform manner with no portion being raised more than 1 m above an adjacent portion. All perpends, quoins, etc, shall be kept strictly true and square and the whole properly bonded together.

Brickwork shall be built in stretcher bond or english bond as shown on the Drawings, and bats shall not be used except where required for the bond. All joints shall be 10 mm wide and four courses shall measure 320 mm.

Brickwork for cavity walls and solid walls built in stretcher bond shall be tied with wall ties placed not more than one metre apart in every third course, and shall be staggered vertically. At openings, the ties shall be positioned not more than 300 mm apart along the periphery of the opening and 150 mm from the opening.
Face brickwork shall be kept perfectly clean and rubbing down of the brickwork shall not be allowed. Scaffold boards shall be turned back during heavy rain to avoid splashing. Soiled brickwork shall be cleaned at the Contractor's expense, and the cleaning method shall be approved by the Engineer.

8.11.2(c) Reinforced brickwork

Brickwork over door and window openings shall be reinforced with steel rods, welded or expanded mesh, etc. Reinforcement shall be placed in each course of brickwork for a minimum of 4 courses or as shown on the Drawings. Reinforced brickwork shall continue at least 300 mm on each side of the openings.

Brick lintels shall be built upon rigid temporary supports left in position for not less than 7 days after brick-laying. Prestressed concrete lintels may be used where approved by the Engineer.

8.11.2(d) Key for plaster

Joints of all brickwork receiving plaster shall be raked out, or the brick surfaces shall otherwise be prepared with an acrylic slurry or any other approved bonding agent.

8.11.2(e) Damp-proofing

A damp-proof course shall be laid over the full width of all the walls at a minimum height of 150 mm above the final ground level or wherever else it may be required, and it shall be lapped for at least 150 mm at angles and joints. A damp-proof course shall also be laid and stepped up under all external sills.

8.11.2(f) General

Rough and fair cutting shall be performed as required, and the brickwork shall be fitted around any steel work. Face brickwork shall be carefully cut and fitted to suit fittings.

Chases shall be left or formed for edges of concrete floors, staircases, etc. Chases shall also be provided wherever they may be required for pipes, conduits, switch boxes, distribution boards, and the like. Joints shall be raked out for flashings.

8.11.2(g) Plaster coats

A plastered finish shall consist of a single coat, comprising one application of a 1:6 cement:sand mixture with a wood or steel-float finish.

8.11.2(h) Thickness

The total thickness of the plaster finish shall be 13 mm minimum and 20 mm maximum.

8.11.2(i) Workmanship

All plaster work shall be finished smooth and ready to receive paint. Plaster shall be flush with the faces of all switch and plug boxes, the interiors of which shall be kept free from plaster. Plastered surfaces shall be plumb and jambs and reveals shall be formed square.

The plasterer shall cut out and make good all cracks, blisters and other defects and leave the plaster work, on completion, in a state which is acceptable to the Engineer.

8.11.2(j) Measurement and payment for brickwork and plaster work will be as follows:

a) Brickwork:

(i) (Thickness, type and class indicated).....**Unit : m²**

(ii) Etc for other thicknesses, types and classes

The unit of measurement shall be the square metre of each type of brickwork built, calculated from the leading dimensions of the brickwork. Areas of pipes, etc, built into brickwork shall not be included in the areas measured. At corners and intersections common to more than one brick wall, the areas shall be measured only once.

The tendered rates shall include full compensation for the construction of the brickwork complete as specified, including pointing, the building-in of conduits, beams, lintels, pipe sleeves, doors, windows, the raking-out of joints, damp-proof course, brickforce reinforced as specified, etc.

b) Plaster Work:

(i) (Thickness of plaster and finish indicated) .....**Unit : m²**

(ii) Etc for other thicknesses and finishes

The unit of measurement shall be the square metre of each type of coat completed as specified.

The tendered rates shall include full compensation for the construction of the plaster work, including the supply of all materials, mixing, applying, finishing, forming reveals, joints, narrow widths, rounded angles, v-joints, etc, complete as specified.

PSG 8.13 Break into existing channel inlet, modify channel and make good. .....Unit : Sum
The tendered rate shall include full compensation for all labour and material to break into the existing channel inlet, all excavation, the disposal of all surplus material, the modification of the channel inlet to accommodate the new concrete channel into the new concrete wall, all formwork, concrete (reinforcement measured elsewhere).

PSG 8.14 **Preparation of existing concrete surface** ..... **Unit : m^2**

The tendered rate shall include full compensation for the delivery and supply of all material and labour to scabble the existing concrete and to apply a wet to dry epoxy to the top of the scabbled surface. The bonding agent shall be SikaTop-Armatec 110 EpoCem (or similar approved).

PSG 8.15 **Sand blasting of walls and floors to expose aggregate**..... **Unit : m^2**

Various structures shall be scheduled.

The tendered rate shall include full compensation for the supply and delivery of all material and labour to sandblast the channel walls and floors before the application of coating system.

PSG 8.16 Screeds

(a) 1:3 floor screeds with falls including V-joints to form panels and a smooth steel trowelled finish/power float finish to top:

(i) Description of application and thickness..... Unit : m^2

(ii) Etc for other applications and thicknesses

The unit of measurement shall be the square metre of screeds constructed.

The tendered rate shall include full compensation for constructing the screeds as specified including the supply of all materials, preparing the concrete surface to receive the screeds and for all else that may be necessary to complete the work.

PSG 8.17 **Cast in pipes with or without puddle flanges** ..... **Unit : No**

Various pipe diameters and wall thicknesses will be measured.

The tendered rate shall make full compensation for casting the pipe into the wall including grouting (if necessary), supplying and installing joints as per the detail drawing, adapting of formwork around the pipe and ensuring a watertight seal. Puddle flanges and other couplings are measured elsewhere.

PSG 8.22 **Dowels** ..... **Unit : No**

Installation of dowels will be measured by number and the diameter and type shall be stated.

The Contractor shall prepare the existing surface where the concrete joins as follows:

(i) Scabble the entire area thoroughly, to expose the coarse aggregate or rock.
(ii) Install galvanised steel dowels along the length of the joint.
(ii) The dowels shall be installed minimum of 450mm deep into the existing concrete or rock using Sika AnchorFix-2 or Hilti-HIT-HY150, or equal, approved epoxy grout approved by the Engineer and 800mm deep into the new concrete area.
(iv) Wash and clean the entire contact area.
(v) Immediately before casting, and in accordance with manufacture's instructions, apply wet to dry epoxy to the entire contact area.

The rate shall cover the cost of all materials, including the dowels and epoxy grout and all labour and plant to execute the work as specified.

PSL **MEDIUM-PRESSURE PIPELINES**

PSL 2 **INTERPRETATIONS**

PSL 2.1 **References**

PSL 3 **MATERIAL**

PSL 3.1 **General**

Add the following paragraphs:

"For each type of pipe to be delivered to the site the individual pipes shall have a standard length, which shall correspond with standard lengths offered by the pipe manufacturer in his catalogue, with a maximum allowable variation in length of ± 2%.

A pipe which has a shorter or longer length than the defined standard will be rejected by the Employer's Agent, except where such non-standard lengths are required in terms of the contract and have been specifically manufactured or cut as such by the pipe manufacturer or supplier."

PSL 3.4 **Steel Pipes, Fittings And Specials**

PSL 3.4.2 Pipes of nominal bore up to 150 mm

Add the following:

"The pipes shall be 'normalised' or seamless steel pipes and shall be used with malleable cast iron fittings complying with the requirements of SABS 509."

Add the following:

PSL 3.4.3 Pipes of nominal bore over 150mm

Add the following after the last sentence:

Grade C steel pipe shall be used, and the wall thickness must comply with column 3 of table 2 of SANS 719."

Add the following:

PSL 3.4.5 Stainless steel pipes

"Stainless steel pipes shall be Grade 304, shall comply with ANSI B36.19 and the wall thickness shall comply with schedule 10S."

PSL 3.7 **Other Types of Pipes**

PSL 3.7.1 PVC-U pipes

Replace "uPVC" with "PVC-U" in the heading and first sentence.

Replace "SABS 966" with "SANS 966 : PART 1:2000 (PVC-U).

Add the following:

"All PVC-U pipes shall be class/PN 16 unless otherwise specified using spigot and socket rubber ring joints. All fittings (bends, tee's reducers, etc.) to PVC-U pipes shall be Ductile Iron to EN12842, fusion bonded thermoplastic coated internally and externally with Plascoat PPA 571 HES, to minimum 0.25m coating thickness with EPDM rubber insert seal or stainless steel 304 flanged tees as billed. All Duclile iron and steel fittings must be wrapped."

PSL 3.7.2 Polyethylene pipes

Replace "SABS 533" with "SANS ISO 4427 : 1996 (PE63, 80, 100)".

Add the following:

"All HDPE pipes shall be HDPE PE100 to SANS/ISO 4427 pipes, minimum class/PN16 or as specified in the schedule of quantities and 20 to 40mm dia HDPE pipes shall be PN16 or as specified in the schedule of quantities. All fittings shall be class 16. All bends and tees will be moulded and class 16''.

PSL 3.9 **Corrosion Protection**

PSL 3.9.2 Steel Pipes

Steel pipes shall be mild steel or stainless steel as shown on the drawings or shown in the schedule of quantities.

All mild steel pipes, specials and fittings with nominal diameter up to and including 150mm shall be hot dipped galvanized to SANS 121 and SANS 32 and Carboguard (Product of Carboline) 891 coated or stainless steel 304 as billed. All steel pipes, specials and fittings with nominal diameter greater than 150mm shall be lined internally and coated externally with Protective Epoxy Paint Product Carboguard (Product of Carboline) 891, applied in three coats and minimum 125 microns dft (dry film thickness) per coat to manufacturer's specifications.

Plain ended fittings shall be joined with approved couplings coated with 300 microns of a Polymer Resin product to the manufactures specifications.

1) Specification

The cement mortar lining shall be applied in accordance with the American Water Works Association Specification C205-80 or as amended except where the Specification C205-80 is at variance with the requirements of this specification.

2) Thickness

The thickness of the cement mortar lining shall be 12 mm and shall be subject to a tolerance of 2 mm.

3) Roundness of pipe ends

The pipe ends shall be held truly round during the placing and the setting of the cement mortar lining.

4) Materials

Cement shall be freshly manufactured ordinary Portland cement complying with SABS 471-1971.

Sand shall consist of inert granular material and the grains shall be durable and uncoated. The sand shall be well graded and pass a 1,5-mm mesh screen. Sand shall be free from injurious amounts of clay, lumps, shale, soft or flaky particles, mica, loam, oil, alkali, and other deleterious substances. The total mass of such substances shall not exceed 3 per cent. The source of the sand shall be stated by the tenderer and be approved by the Employer's Agent.

Water shall be clean and free from injurious amounts of mud, oil, organic materials or other deleterious substances. Admixtures may be used provided the additive will not injuriously affect the water quality and written approval has been obtained from the Employer's Agent. The contractor shall submit test data to substantiate admixture performance.

The proportions of the ingredients shall be approved by the Employer's Agent. These proportions shall be determined from the characteristics of the aggregate. Measurement of the materials shall be by weight and the water-cement ratio shall be controlled and kept to a minimum, with an allowance being made as necessary for the most effective machine operation and adhesion of mortar to the pipe."

PSL 3.9.3 Protection against Electrolytic corrosion

Add the following:

"All nuts and bolts for pipes, pipe specials etc must be provided with an approved insulating material to prevent Electrolytic corrosion."

PSL 3.9.5 Joints, Bolts, Nuts and Washers

Add the following:

All bolts, nuts and washers for mild steel pipework shall be hot dip galvanized to SANS 121 and SANS 32 and shall be grade 8.8 to SANS 1700 and ISO 898 or stainless steel 316, as shown on the drawings or as billed.. Two washers shall be used with every bolt connection to prevent damage to coatings. Nuts, Bolts and Washers for stainless steel pipes shall be stainless steel grade 316 and must be treated with a Nickel based anti-seize compound such as Chesterton 725 or equivalent."

Only stainless steel bolts, washers and nuts shall be used on all fittings such as saddles, flanges, short collar couplings, etc.

Suitable isolation shall be provided between flanges, washers and bolts to prevent galvanic corrosion between dissimilar metals (e.g. between stainless steel and mild steel or cast iron). Shaft thread shall be covered with heat shrink insulation (or similar approved) and 3mm Caf non-conductive washers shall be used with standard washers where dissimilar fittings are joined.

PSL 3.9.6 ***Corrosive soil***

Steel pipes in contact with soil shall be wrapped with Densopol 80 HT or an equivalent approved product, strictly in accordance with the manufacturer's instructions and as described on the drawings.

PSL 3.10 **Valves**

Replace the contents of this subclause with the following:

"Valves shall be the standard cast-iron gate valve for waterworks and shall comply with the following requirements:

(a) Valves shall be left hand closing with a non-rising spindle and spindle cap bolt to spindle with stainless steel 316 bolt.

(b) Valves shall be class 16.

(c) Valves shall comply with the requirements of SABS 664/1974. "AVK" or similar approved.

(d) Valves shall be the resilient seal type.

(e) Valves shall be coated before delivery with a 225 micron Copon EP 2300 epoxy paint applied to all internal services after it has been thoroughly cleaned by grit blasting to SA2½ finish in compliance with SIS 050900.

(f) The direction for turning the valve open or closing must be permanently marked on the valve."

"Fire hydrants shall be the standard cast-iron fire hydrant and shall comply with the following requirements :

(a) Fire hydrants shall be anti clockwise closing with a non-rising cast iron spindle and spindle cap and also fitted with a captop with a stainless bolt to attach the captop to the hydrant spindle. No clips, split pins or screws allowed. Hydrants shall be supplied and installed complete with a flanged extension piece complete with cadmium plated nuts and bolts to ensure depth not greater than 400mm.

(b) Fire hydrants shall be class 16

(c) Fire hydrants shall be a type 65 "AVK or Ainsworth" or any approved by the local authority

(d) Fire hydrants must have London Round thread outlets

(e) Hydrants shall be coated before delivery with a 225 micron Copon EP 2300 epoxy paint applied to all internal services after it has been thoroughly cleaned by grit blasting to SA2½ finish in compliance with SIS 050900.

(f) The direction for turning the fire hydrant open or closing shall be permanently marked on the fire hydrant.

PSL 5 **CONSTRUCTION**

PSL 5.2.2 Welding of HDPE pipes

The HDPE pipes shall be supplied in straight lengths, and not in coils, to avoid the pipe ends from curling and thus hindering the welding process. To reduce the number of welds necessary, pipes should be supplied in the maximum straight lengths available.

The HDPE pipe shall be joined by means of heat fusion using approved butt welding equipment by fully trained operators in accordance with **SANS 10268-1** and the pipe manufacturer's specifications. The Contractor shall ensure that the welds are kept dust free. The Contractor shall confirm with the Employer's Agent of the welding machine and of the welding parameters and tables to be used. Test welds shall be carried out by the Contractor and shall be tested by an independent laboratory and once approved by the Employer's Agent before the welding on site can commence. No additional payment will be made for test samples which are required and allowance must be made for one test weld per pipe diameter applicable to the contract.
The Contractor shall provide a digital thermometer or similar for the accurate measurement of the weld temperatures.

No separate payment shall be made for the welding of pipes and the removal of internal and external beading is not required, except where pipe bursting will be undertaken.

PSL 5.6 **Valve and Hydrant Chambers**

PSL 5.6.1 General

Replace the words "drawing L-1" in the second line with "the drawings".

PSL 5.6.2 Construction of chambers

Replace the words "drawing L-1, L-2 and L-3" in the fourth line with "the drawings".

PSL 5.10 **Disinfection of Potable Water Pipeline**

Add the following :

"d) the pipeline shall also be flushed repeatedly through each saddle, prior to connecting to the existing house connection to ensure each house connection is clean before connecting to the existing house connection.

e) the local authority and Employer's Agent will be given at least 48 hours notice prior to disinfection of the pipeline, to arrange suitable attendance of the procedure.

f) testing of the municipal water from the pipeline after the sterilized water was flushed out."

PSL 5.11 **Standpipes**

Standpipes shall be erected in positions and to details shown on the drawings.

PSL 5.12 **Marker Blocks**

Marker blocks shall be manufactured and positioned as shown on the drawings.

PSL 5.13 **Pipeline Route Markers**

Route markers for the various water pipelines shall be erected in positions and be manufactured according to details shown on the drawings."

PSL 7 **TESTING**

PSL 7.3 **Standard Hydraulic Pipe Test**

PSL 7.3.1 Test pressure and time of test

PSL 7.3.1.2 *Add the following:*

The test pressure for field testing shall be the working pressure indicated by the class of the pipe.

(e.g. Test at 12 bar for class 12 pipe).

"The Employer's Agent may order re-testing of any section of the entire network at any time after the trench is backfilled. The contractor will do the tests and any remedial work required at his own cost.

Any isolating valves and/or end caps, blank flanges, or other isolating devices required for testing mixed types of classes of pipelines which traverse over a wide range of altitudes, will be installed by the contractor at his own cost."

PSL 8 **MEASUREMENT AND PAYMENT**

PSL 8.2 **Scheduled Items**

PSL 8.2.1 Supply, lay and bed pipes complete with couplings

Add the following after the clause:

"The tendered rates shall also include full compensation for the cost of all labour, material, plant, chemicals and overheads for the complete sterilisation of the newly installed potable water reticulation system and the disposal of the sterilising solution as approved by the Employer's Agent."

The tendered rate shall also include full compensation for testing the water from the newly installed and sterilized pipeline by an independent laboratory to confirm it conforms to SANS 241:2015 for E.coli, Total Dissolved Solids, Turbidity and pH.

PSL 8.2.11 Anchor/Thrust blocks and pedestals

Add the following:

"The tendered rates shall also include the wrapping of uPVC pipes and fittings with Densopol 80 or similar approved material where the pipes and fittings are in contact with concrete."

Add the following items:

PSL 8.2.17 Marker blocks / pipeline route markers

Measurement and payment shall be as per Scheduled item 8.2.9 (SABS 1200 LD).

PSL 8.2.18 Connection to existing watermain **Unit : No**

The tendered rate shall include full compensation for the location of the main pipe, excavation, removal of surplus material, cutting into the main pipe supply and installation of all fittings and constructing the connection as shown on the drawings, backfilling with clean sand and compacting to 100% Mod Aashto.
The tendered rate will also include all liaison with the local authority and closing of the water supply and notifying affected residents.

PSL 8.2.30 Specific testing of HDPE pipe material as per SANS 4427 and SANS 6269

Carbon Black Content Test ..... **Unit : No**

Carbon Black Dispersion Test ..... **Unit : No**

Oxidation Induction Time Test ..... **Unit : No**

Melt Flow Rate Test ..... **Unit : No**

Tensile Test ..... **Unit : No**

The tendered rate shall make full compensation to provide the sections of pipe to be tested, arranging with an independent laboratory for testing, performing the tests as per the relevant specification and supplying the results thereof to the Engineer.

Should the results of any test indicate that the quality of the materials utilised/standard of workmanship achieved is not in accordance with the specification, the cost of such test will be for the contractor's cost and no payment will be made through these items.

PSLB **BEDDING (PIPES) (1983)**

PSLB 3.2 **Selected Fill Material**

Add the following:

"Where required, selected fill material used for bedding, is to be stabilised with 5% cement as specified under subclause PSDB 3.5(c)."

PSLB 3.3 **Bedding**

Add the following:

"PVC-U and HDPE pipes are considered to be flexible pipes for the purpose of this subclause."

PSLB 3.4.1 Suitable material available from trench excavation

Replace the words "(but is not required)" in the fifth line with the words "(at his own cost)".

PSLB 5 **CONSTRUCTION**

PSLB 5.1 **General**

PSLB 5.1.2 Details of bedding

Add the following paragraph.

"The dimension "X" for flexible and rigid pipes as indicated on drawing LB-1 will be 150 mm unless otherwise indicated on the drawing. The dimension "X" will be measured from the invert of the pipe."

PSLB 5.1.4 Replace "90%"

with:

"90% (100% for sand)".

PSLB 7 **TESTING**

Add the following :

PSLB 7.3 **Routine Testing**

The Contractor must test the bedding density and grading every 50m. A laboratory grading analysis must be undertaken every 50m. All test positions must be recorded by the Contractor and submitted with test results to the Employer's Agent within 7 Days of placing the bedding.

PSLB 8 **MEASUREMENT AND PAYMENT**

PSLB 8.1 **Principles**

PSLB 8.1.1 Supply of Bedding Materials measured separately

Insert the following words after the word "placing" in the last sentence : "density testing and grading analysis every 50m,".

PSLB 8.1.3 Volume of Bedding Materials

Add the following to paragraph (b):

"The depth of bedding as specified in PSLB 5.1.2 is applicable. The volume of bedding material displaced by the pipeline shall not be included in the calculation of the volume of bedding material."

PSLB 8.1.5 Disposal of Displaced Material

Replace the contents of this subclause with the following:-

"Material displaced by the pipeline and by importation of material from sources other than trench excavation, shall be disposed of outside the boundaries of the site."

PSLB 8.1.6 Freehaul

Notwithstanding what is specified in subclauses 8.2.1, 8.2.2.2, 8.2.2.3, 8.2.4 and 8.2.5, the freehaul distance for disposal of all displaced (surplus) material, shall be unlimited."

PSLB 8.2 **Scheduled Items**

ADD THE FOLLOWING:

"PSLB 8.2.7 Provision of stone/geofabric to deal with water ..... **Unit : m^3/m^2**

If in the opinion of the Employer's Agent, the Contractor complied with the requirements for dealing with water as specified in PSA 8.8.7, the Employer's Agent may instruct the installation of crushed stone and filter fabric. Payment for these items will only be made where instruction was given in writing by the Employer's Agent.

The provision of crushed stone bedding material will be measured by volume based on the specified trench width and a maximum layer thickness of 300 mm unless a greater depth has been specified by the Employer's Agent.

The unit rate shall cover the cost of supplying and laying the crushed stone.

The filter fabric will be measured separately by area based on the specified trench width, a stone bedding thickness of 300 mm and an overlap of 300 mm.

The rate shall cover the cost of the supply, delivery and laying of the filter fabric.

PSME **SUBBASE (1981)**

PSME 3 **MATERIALS**

PSME 3.2 **Physical Properties**

PSME 3.2.1(d) Regional factor

The regional factor for the area is 0.60.

PSME 3.2.2 Gravel shoulder and gravel wearing course material

Replace the contents of this subclause with the following :

''The material used for the gravel wearing course shall comply with the following parameters as defined in TRH 20; subject to such other requirements involving future upgrading, where so indicated on drawings or directed by the Employer's Agent:

Maximum Size : 37.5mm
Oversize Index : 0
Shrinkage Product : 100 to 240 based on
linear shrinkage x per cent passing 0.425mm sieve
Grading Coefficient : 16 to 34 based on
(%passing 26,5mm-%passing 2,0mm) x % passing 4.75mm⁄ 100
CBR: 15% at 95% of Mod AASHTO density (soaked)

Where gravel shoulders or staged construction is contemplated for low volume roads (lightly trafficked), a base material as specified in PSMFL 3.2 and PSMFL 3.3 may be required to function as a gravel shoulder and/or wearing course."

PSME 5 **CONSTRUCTION**

PSME 5.3 **Processing**

b) Heavy grid rolling

Insert the following after the first sentence:

"Research has shown that grid rolling is only effective for material where the Treton impact value is in excess of twenty(20)."

PSME 5.4 **Placing and Compaction**

PSME 5.4.1 Placing

Substitute "the project specification" in the second paragraph of ME 5.4.1 with "ME 6.1.4"

Add the following:

"Where size reduction is required to comply with the specifications, and grid rolling is required to attain such requirements, the process shall be carried out as outlined in PSME 5.3(b) "

PSME 5.4.4 Compaction

Replace the sub-subclause with:

"The sub-base shall be compacted to a density of at least 97% of modified AASHTO density(or 100% of modified AASHTO density in the case of sand complying with subclause 2.2 of SABS 1200M and deemed suitable as a subbase under very specific circumstances), unless otherwise specifically indicated on drawings. Gravel shoulders and any gravel wearing course shall be compacted to a density of at least 97% of modified AASHTO density unless otherwise specified and/or indicated on drawings. "

PSME 5.7 **Transport**

Replace the contents of this subclause with the following:

"All movement of material shall be regarded as free-haul. No haulage shall be paid."

PSME 7.2.2 Routine Inspection and Testing

Replace the values in Table 3 with the applicable criteria for minimum average density and minimum density value for any single test, for the specified density, based on the number of tests per lot as specified in PSM 7.4.

PSME 8 **MEASUREMENT AND PAYMENT**

PSME 8.1 **Basic Principles**

Insert a semi-colon in the first line of paragraph (b) after the words ".... will be paid for once only" and delete the rest of the paragraph.

Replace paragraph (d) with the following:

(d) that in the case of material from a commercial source or from borrow pits selected by the contractor, no additional payment will be made for the class of excavation, method of processing (except stabilising), or overhaul unless otherwise specified in the project specification."

PSME 8.3 **Scheduled Items**

PSME 8.3.3 Construct the sub-base course/shoulders/gravel wearing course with material from commercial sources or designated borrow areas

Replace the heading of this item with the following:

"PSME 8.3.3 Construct the sub-base course/shoulders/gravel wearing course with material from commercial sources"

Add the following to the payment description paragraph:

"This item shall also be applicable to the construction of sub-base course/ shoulders/gravel wearing course with material from borrow pits selected by the contractor."

"PSME 8.3.11 Treatment of subbase with:

(a) Weed killer .....**Unit : m²**

(b) Insecticide.....**Unit : m²**

The tendered rates shall include full compensation for the supply, spreading and mixing-in or application of the poison.

Only areas that were treated on the written instructions of the Employer's Agent will be measured for payment."

PSMJ **SEGMENTED PAVING**

PSMJ 3 **MATERIALS**

PSMJ 3.1 **Units**

PSMJ 3.1.2 Class, strength and type

The class, strength and type shall be as indicated in table below:

Area No	Description of Area	Class[1]	Thickness[4] -guideline (mm)	Type[2]	Thickness Specified (mm)	Surface treatment/colour
	Road	40/2,6	60/80	S-A[3]		
	Road gradient > 8%	40/2,6	80	S-A[3]	70	exposed aggregate/??
	Intersection area	40/2,6	80	S-A[3]		
	Parking lot	40/2,6	60/80	S-A[3]	70	exposed aggregate/??
	Sidewalk	30/2	60	S-A[3]		

Note: 1) Refer SANS 1058:2012 Table 2
2) Refer SABS 1058:1985 Clause 4.2.1
3) Geometrical interlock on all vertical faces
4) *To select appropriate thickness based on all environmental Factors. 80mm blocks have an advantage over 60mm, as the additional depth mitigates against wash out. Also, a prerequisite where heavy turning movements prevail. Where Exposed aggregate required 80mm becomes 70mm*
5) The manufacturer to supply purchaser with three blocks of the agreed colour and surface texture(as per SANS 1058 Clause 4.2.4), to serve as reference sample.
6) Note abrasion resistance requirement as per SANS 1058:2012 Clause 4.5

PSMJ 5 **CONSTRUCTION**

PSMJ 5.1 **Preparation**

PSMJ 5.1.2.2 *Subbase not stabilized*

Add:

"In addition, where the resultant block paved area will be subjected to traffic, it is desirable to provide a seal in order to counter the damaging effects caused by the between 30% to 35% of rainfall penetrating newly laid block pavements prior to the development of the lock-up stage. A seal using an inverted bitumen emulsion will be allowed for under SABS 1200MG Scheduled Item 8.4.1 or SABS 1200MH Scheduled Item 5.1, for all unbound material underlying the bedding sand." *(In view of the likelihood of higher absorptive properties and lower densities compared to a crushed base, a higher spray application rate of up to 1,0litre per square metre should be considered in order to seal effectively)*
(Alternative options to counter permeability based on research may be introduced-see Clause PSMJ5.7)

PSMJ 5.2 **Edge Restraints**

Add:

This is a specific requirement in order to retain the sand bedding and ensure that units at the edge of the pavement do not creep outwards or rotate under load with consequent opening of joints and loss of interlock.
It is also a prerequisite that such edge restraint be provided with expansion joints of width 10mm at 10metre intervals. The joints shall be suitably sealed using a suitable filler such as Flexcell or similar proven and approved and a durable 20mm X10mm silicone sealant or proven and approved equivalent.
Measurement and payment shall resort under the relevant items for SABS 1200MK Items 8.2.1 and 8.2.2

PSMJ 5.3 **Placing and Compaction of Sand Bed**

Add the following **:**

"Bedding sand must be distributed on the underlying layer a few metres at a time between screed rails laid approximately 2m apart and levelled using a screed board. No one should walk on the screeded sand surface, as this causes uneven compaction and an uneven block surface. Poorly filled edges and grooves left by the screed rails shall be filled with sand and levelled. Adjust the bedding sand level so that the compacted paving will stand 5mm to 10mm above the level of surrounding edges to allow for subsequent settlement."

PSMJ 5.4 **Laying of Units**

Insert after fifth sentence, before the sentence: "Whole units shall be laid first" the following:

"The blocks shall be laid from the lowest corner moving uphill when placed on a grade, to prevent the effect of gravity and the movement of the laying crew from opening up joints between the blocks already laid. Work should move outwards in both directions along a diagonal laying face to achieve maximum productivity."

And:

"The laying pattern to be herringbone and shall satisfy the requirements of the guideline booklet published by the Concrete Manufacturers Association."

PSMJ 5.6 **Compaction of Units**

PSMJ 5.6.1 General

Add:

"Also, before the introduction of jointing sand, the paving shall be inspected and any blocks that have settled incorrectly- either too low or too high shall be adjusted in level by removing or filling with bedding sand. Any damaged blocks shall also be removed and replaced at this stage."

PSMJ 5.6.2 Paving Subject to Wheel Loads Exceeding 30kN

Add:

"Unless otherwise instructed by the Employer's Agent, all road sections and parking lots will be subjected regularly to wheel loads exceeding 30kN."

PSMJ 5.7 **Joint Filling**

Insert after the second sentence:

"Both the sand and the paving units should be as dry as possible when sand is spread."

Add the following:

"During the early life of the paving, it is common for jointing sand to be lost due to factors such as pavement settlement, traffic vibration, and wind and water erosion. Newly laid paving shall be inspected at least at monthly intervals or more frequently where so dictated by environmental conditions, and if loss of jointing sand is observed, the pavement shall be re-sanded as herein before described. Such need for re-sanding, soon after having been laid and/or during the maintenance period, shall be deemed covered in the rates for Scheduled item 8.2.2".
(Refer PSMJ 5.1.2.2: Research has shown that permeability of the joints can be reduced by up to 50% by adding 10% by mass of lime or 6% by mass of bentonite to the jointing sand. Cement is not recommended. If such an option is to be considered, a measurement and pay item need to be introduced)"

Add New sub-clause

PSMJ 5.8 **Anchor Block Beams**

Anchor block beams are required where the longitudinal gradient of the road (side-walks excluded) is steeper than 8 percent. Between 8 and 12 percent gradient such anchor beams at the lower end of the paving, shall be provided at 30 metres centre to centre; between 12 and 15 percent at 20metres centre to centre; and between 15 and 20 percent at 15metres centre to centre, unless otherwise shown on drawings. A minimum dimension of 150mm wide and 230mm deep shall apply unless otherwise shown on drawings, using Class 35/19 concrete.
For ease of construction, the Concrete Manufacturers Association recommends that the blocks are laid continuously up the gradient. Thereafter the required rows of blocks are uplifted in the position of the beam, the supporting pavement

layers excavated to the required depth, and the beam cast, such that the top of the beam is 7 to 10mm lower than the surrounding blockwork. This allows for settlement of the pavers. This method of construction will ensure that the anchor-beam interlocks with the segmental blocks. The paving unit pattern finally selected (herringbone at 45^{O} to edge restraint, unless otherwise shown on drawings), as well as subsoil drain requirements, however, may require a different strategy to be adopted. Any cutting of the blockwork, including excavating into cemented layers (cemented underlying layer recommended for steep gradients), shall be carried out with the utmost care, using proven and approved cutting equipment.

Immediately on the higher side of, and adjacent to the anchor-beams, a suitable subsoil drain is required as per detail drawings, with the subsoil drain daylighting as shown on drawings. A no-fines concrete block wrapped in a Grade 2 geotextile incorporating a slotted conduit (Kaytech Geopipe 5mm X 65mm diameter, or a proven and approved equivalent alternative), is required.

The anchor block shall also be provided with 25mm diameter weepholes at 1,0m centre to centre in the plane of the sand bedding layer, to minimize the risk of a seepage water pressure build-up.

PSMJ 8 **MEASUREMENT AND PAYMENT**

PSMJ 8.2 **Scheduled Items**

PSMJ 8.2.1 Provision of edge restraints

Add the following :

"The rates shall cover all the costs for excavating, bedding, laying (including expansion joints), jointing, compacting and backfilling, including the removal of excess material."

PSMJ 8.2.2 Construction of Paving Complete

Add the following:

"The tendered rate shall, in addition, also include full compensation for cutting units to fit edge restraints and anchor beams where applicable, and for the removal and disposal of all resultant waste material from the Site of the Works."

PSMJ 8.2.3 Cutting units to fit edge restraints ..... **Unit : m**

DELETE THE FIRST SENTENCE OF THIS CLAUSE AND REPLACE WITH THE FOLLOWING:

"No separate items will be scheduled for straight, raking and circular cutting."

PSMK KERBING AND CHANNELING (1983)

PSMK 3 **MATERIALS**

PSMK 3.1 **Concrete**

Add the following:
"The contractor shall timeously submit the concrete mix design for cast-in-situ kerbing to the Employer's Agent for approval and no kerbing shall be placed before the mix design has been approved."

PSMK 3.2 **Precast Kerbing and Channelling**

PSMK 3.2.1 General

Add the following:

"The profile/dimensions of pre-cast kerbs and channels must be in accordance with the details shown on the drawing."

PSMK 3.9 **Bedding Material**

Replace the contents with the following:

"The concrete on which the kerbing and channelling will be placed must be of the strength and thickness specified in the drawings."

PSMK 5 **CONSTRUCTION**

PSMK 5.1 EXCAVATION AND BEDDING

Replace "90%"

with:

"93% (100% for sand)"

PSMK 5.2 **Kerbing and Channeling of Precast Concrete**

Replace the first sentence with:

"Kerbing and Channelling of pre-cast concrete must be placed on a concrete bedding as required in PSMK 3.9".

Add the following subclauses:

PSMK 5.13 **Streetname Kerbing**

Street names must be cast into a full length barrier kerb. The street name must be painted white on a green background and positioned as shown on the drawings or as indicated by the Employer's Agent."

PSMK 5.14 **Watertesting of Kerbs**

After the kerbs, channels inlets etc. have been constructed the kerbs, channels, etc. must be cleaned and tested with water to ensure that no water is standing in any channel. This test must be done after the base has been completed but before the placing of the surface seal. Any adjustments to kerbs, channels etc. must be completed before the surface seal is applied.

PSMK 7 **TESTING**

PSMK 7.2.1 General tests

Delete this subclause.

PSMK 7.2.2 Alternative tests

Replace the heading and contents of this subclause with the following:

"PSMK 7.2.2 Tests

The contractor shall carry out a minimum of 3 cube crushing tests per 1 000 m of kerbing placed. The cost of such tests shall be deemed to be included in the rates tendered for kerbing.

One test shall consist of a set of 6 cubes made with concrete taken from the mixer, the kerbing machine or from any part of the work as ordered.

If, after three cubes of any set of six cubes have been tested after 28 days in an approved laboratory, the average crushing strength is found to be more than 3 MPa less than the specified strength, the kerbing represented by the cubes, will be rejected.

The contractor may apply for resubmission of the rejected section on the basis of cores drilled from the section and tested for estimated actual crushing strength in accordance with SABS method 865 (excluding Appendix A). The cost of drilling and testing the cores will be for the contractor's account, regardless the outcome of the tests on the cores. The number of cores required will be determined by the Employer's Agent and the criterion for rejection or acceptance of the section represented by the cores shall be as specified above for cubes."

PSMK 7.3 **Responsibility for the Cost of Testing**

Delete this subclause.

PSMK 8 **MEASUREMENT AND PAYMENT**

PSMK 8.2 **Scheduled Items**

PSMK 8.2.1 Concrete kerbing

Replace the contents of subclause (b) with the following:

"The unit rate for pre-cast kerbing shall cover the cost of supply of all kerbing, material for jointing (including expansion joints), bedding and backfilling, as well as the cost of all excavating, compacting, testing in terms of 7.2, laying, jointing (including expansion joints), backfilling and the removal of excess material."

Replace "5.8.2" in the third line of paragraph (e) with "5.8.3".

PB BUILDING WORK

PB 01 SCOPE

This section covers the various construction activities associated with the erection of buildings, which form part of certain civil projects.

Building work shall be carried out in accordance with the National Building Regulations and the information contained in this section.

Work appurtenant to the erection of buildings such as earthworks, concrete work, structural steelwork, etc, shall be carried out as specified in the appropriate sections of these specifications and will be measured and paid for under those sections.

PB 02 BRICKWORK, PLASTER WORK AND FLOOR SCREEDS

PB 02.1 Materials

(a) Bricks

Bricks shall comply with SABS 227 and shall be classified according to their intended use as defined below.

Engineering bricks in both the face and stock categories shall be durable and selected for their uniformity of dimension, with a minimum average compressive strength of 49 MPa. These bricks shall be of clay, and shall be pressed or wire cut and free from cracks, chips or defects.

Face bricks shall not require any further decorative treatment and shall be selected for their uniformity of dimension, colour and texture, with a minimum average compressive strength of 28 MPa. These bricks shall be of clay, and shall be pressed or wire cut and free from chips, cracks, stones or other defects. Water absorption shall not exceed 2%. Special care shall be taken in the loading, stacking and handling of face bricks, as no damaged bricks may be used.

Stock bricks shall be suitable for general building work and shall have a minimum compressive strength of 7 MPa. Special stock bricks shall have a minimum compressive strength of 17 MPa. The water absorption of stock bricks shall not exceed 10%.

Satisfactory proof of the load-bearing capacity of the bricks offered shall be submitted before deliveries are made to the Site.

Air bricks shall be well-burnt terracotta and shall be free from cracks and blemishes and lined with copper mosquito gauze.

Three samples of each type of brick shall be submitted to the Engineer for approval. All subsequent deliveries shall be of a standard equal to or better than that of the approved samples.

(b) Cement

Cement shall comply with the requirements of SABS 471, and shall be stored under cover. The use of Portland blast-furnace cement (PBFC) which complies with the requirements of SABS 626 will only be allowed if so specified in the Project Specifications.

(c) Aggregate

Fine aggregate shall be naturally occurring sand or shall consist of crushed rock or gravel, and shall be hard, clean and free from adherent coatings or other deleterious matter. Sand for plaster and mortar shall comply with the requirements of SABS 1090, whereas the aggregates for normal and granolithic floor screeds shall comply with the requirements of BS 1199 and BS 1201 respectively.

(d) Water

Water shall be clean and free from clay, silt, oil, acid, alkali, organic or other matter which would impair the required strength and durability of the mortar, plaster or floor screed.

(e) Wall ties

Wall ties shall be of the galvanized, crimped, single-wire type with a 3,5 mm diameter, and shall comply with the requirements of SABS 28.

PB 02.2 **Construction of Brickwork**

(a) Cement mortar

Cement mortar shall, unless otherwise specified, consist of 1 part of Portland cement to 4 parts of sand by volume for normal brickwork and 1 part of Portland cement to 3 parts of sand by volume for reinforced brick- work. The ingredients for cement mortar shall be measured in proper gauge boxes on a boarded platform and thoroughly mixed. Alternatively, mixing may be by means of an approved mechanical batch mixer. Only when the dry ingredients have been thoroughly mixed and a mixture of uniform colour has been obtained may the water be added in sufficient quantity to obtain mortar with the required consistency.

Cement mortar shall be used within two hours of adding water to the mix and shall not be used after two hours or if it has begun to set. Mortar shall be turned over frequently until it is used to prevent it from setting.

(b) Brickwork

Dimensions of all the brickwork shall be set out and built as shown on the Drawings. Bricks shall be kept wet before laying and the top of brickwork shall be wetted before any further bricks are laid. Bricks shall be well buttered with mortar before being laid and all joints shall be thoroughly flushed up as the work proceeds. All joints to face brickwork shall be neatly made and key drawn with a 6 mm key.

Brickwork shall be carried up in a uniform manner with no portion being raised more than 1 m above an adjacent portion. All perpends, quoins, etc, shall be kept strictly true and square and the whole properly bonded together.

Brickwork shall be built in stretcher bond or English bond as shown on the Drawings, and bats shall not be used except where required for the bond. All joints shall be 10 mm wide and four courses shall measure 340 mm.

Brickwork for cavity walls and solid walls built in stretcher bond shall be tied with wall ties placed not more than one metre apart in every third course, and shall be staggered vertically or as otherwise specified in the Project Specifications. At openings, the ties shall be positioned not more than 300 mm apart along the periphery of the opening and 150 mm from the opening.

Face brickwork shall be kept perfectly clean and rubbing down of the brickwork shall not be allowed. Scaffold boards shall be turned back during heavy rain to avoid splashing. Soiled brickwork shall be cleaned at the Contractor's expense, and the cleaning method shall be approved by the Engineer.

(c) Reinforced brickwork

Brickwork over door and window openings shall be reinforced with steel rods, welded or expanded mesh, etc. Reinforcement shall be placed in each course of brickwork for a minimum of 4 courses or as shown on the Drawings. Reinforced brickwork shall continue at least 300 mm on each side of the openings.

Brick lintels shall be built upon rigid temporary supports left in position for not less than 7 days after bricklaying. Prestressed concrete lintels may be used where approved by the Engineer.

(d) Key for plaster

Joints of all brickwork receiving plaster shall be raked out, or the brick surfaces shall otherwise be prepared with an acrylic slurry or any other approved bonding agent.

(e) Damp-proofing

A damp-proof course shall be laid over the full width of all the walls at a minimum height of 150 mm above the final ground level or wherever else it may be required, and it shall be lapped for at least 150 mm at angles and joints. A damp-proof course shall also be laid and stepped up under all external sills.

(f) General

Rough and fair cutting shall be performed as required, and the brickwork shall be fitted around any steel work. Face brickwork shall be carefully cut and fitted to suit fittings.

Chases shall be left or formed for edges of concrete floors, staircases, etc. Chases shall also be provided wherever they may be required for pipes, conduits, switch boxes, distribution boards, and the like. Joints shall be raked out for flashings.

PB 02.3 **Plaster Work**

(a) Plaster coats

A plastered finish may consist of a combination of one or more of the following:

(i) A single coat or first coat, comprising one application of a 1:6 cement:sand mixture with a wood or steel-float finish.

If a first coat, the plaster shall be wood-floated and then scratched, raked or otherwise roughened to provide a mechanical key for the second coat, which shall be applied within 24 hours. Should it be impossible to apply the second coat within 24 hours, the first coat shall be kept moist until the second coat is applied.

(ii) A second coat comprising one application of a 1:6 cement:sand mixture with a wood-float finish.

(iii) A finishing coat comprising a 1:1,5 gypsum:sand mixture with a steel-float finish.

(b) Thickness

The total thickness of the plaster finish shall be 13 mm minimum and 20 mm maximum.

(c) Workmanship

All plaster work shall be finished smooth and ready to receive paint. Plaster shall be flush with the faces of all switch and plug boxes, the interiors of which shall be kept free from plaster. Plastered surfaces shall be plumb and jambs and reveals shall be formed square.

The plasterer shall cut out and make good all cracks, blisters and other defects and leave the plaster work, on completion, in a state which is acceptable to the Engineer.

PB 02.4 **Floor Screeds**

(a) Normal screeds

Normal screeds shall have a mix proportion by mass consisting of 1 part of Portland cement and 3 parts of fine aggregate. A minimum amount of water is to be used, but it shall be sufficient to allow adequate compaction.

Screeds shall be laid on clean hardened bases, prepared as for granolithic screeds, in panels not exceeding 14 m² and shall be steel-trowelled to a true and smooth finish. In monolithic construction the panels shall not exceed 30 m². Joints in screeds shall coincide as nearly as possible with joints in the bases. The thickness of screeds shall be as shown on the Drawings or as directed by the Engineer.

The entire screed surface shall be free from loose or raised particles of aggregate, trowel marks or from any irregularities, humps or depressions exceeding 5 mm when measured from a 3 m long straight-edge.

Screeds shall be cured for 3 to 7 days as may be directed by the Engineer, and shall be protected from damage.

No moisture-sensitive floor finish shall be laid on screeds unless a reliable moisture test shows that the screed is sufficiently dry to receive the covering.

(b) Granolithic screeds

Granolithic floor screeds shall be composed of 2 parts of Portland cement to 3 parts of aggregate with sufficient water added to obtain a consistency as dry as may be practicable. The screed shall be rendered with a wood float and struck off with a steel trowel after set has commenced.

The granolithic mixture shall be floated onto the concrete floor slab within 12 hours of the latter having been laid. Where this cannot be done within 12 hours, the concrete surfaces shall be thoroughly hacked, cleaned, watered and treated with an approved cement slurry or with an approved bonding agent, as may be directed, before the granolithic screed is laid.

Where a tinted granolithic screed is specified, it shall be placed in two layers, a lower layer placed to within 6 mm of the finished level and an upper layer into which the pigment has been mixed. No dusting on of colouring material will be allowed.

The surface of all granolithic screeds shall be kept damp for a period of at least 7 days after laying by covering it with polyethylene sheeting or by thickly covering it with wet sand, sawdust or hessian kept moist by frequently sprinkling it with water.

The granolithic screeds shall be not less than 20 mm thick, finished to falls as shown on the Drawings, and shall be laid in panels not exceeding 6,0 m². Thresholds shall be finished with granolithic screeds 25 mm thick, treads 25 mm thick, and risers 20 mm thick, including rounded nosings and reedings.

Edges next to walls shall be finished with projecting skirting, 75 mm high, with rounded top edges, unless otherwise specified or instructed by the Engineer.

PB 03 **IRONMONGERY**

PB 03.1 **Materials**

(a) General

All steel and iron work shall be delivered clean and free from rust, pitting or other defects. Shop primings shall be applied before delivery and shall consist of a coat of red oxide paint, or any other approved anti- rust paint on all surfaces.
Unless otherwise specified, all materials shall conform at least to the appropriate SABS or BS standards where such standards apply to ironmongery, steel, cast iron or any other related materials.

(b) Pressed steel door frames

Pressed steel door frames shall comply with SABS 1129 and shall be manufactured from 1,6 mm thick mild-steel sheeting, pressed to the required shapes, properly mitred, welded and reinforced, with all welding neatly cleaned off.

Frames shall be of the widths required to suit the thickness of the walls into which they are built and shall be fitted with suitable tie bars and braces at the bottom. Three lugs to be built into the brickwork shall be provided on each jamb.

Rebates in frames and transoms for doors shall be of the widths required to suit the thicknesses of the doors and shall be fitted with a pair of approved steel butt hinges set flush into recesses in the frames. 4,5 mm thick reinforcing plates shall be welded to the backs of the frames at hinge positions.

Heads of frames over double doors shall be drilled where required to form keeps for bolts and shall be fitted with one rubber buffer for each leaf of the door.

Frames for single doors shall be fitted with approved chromium striking plates and an adjustable striking-plate keeper boxed in at the back of the frame by a welded-on sheet-metal box. The frames shall be fitted with a minimum of two rubber buffers.

Frames shall be protected against twisting and damage during transit and erection.

(c) Pressed-steel doors

Pressed-steel doors shall be manufactured from 1,6 mm thick steel plate. The doors shall be of standard design, pressed to shape with 40 mm reveals all round. The doors shall be strengthened with full-length vertical V-shaped or other approved sectional strengthening ribs projecting to the outer face. Two horizontal stiffening rails shall also be welded to the inner face of the doors.

A door shall be hung on a pair of 100 mm long steel butt hinges with loose pins. The leaves of the hinges shall be welded to both the door and the door frame, and a 1,6 mm thick steel plate shall be welded to the inner face of the door to protect the lock.

One leaf of double doors shall be fitted at the top and bottom with approved 150 mm cast brass barrel bolts in an approved manner and the other leaf shall be fitted with a lock, the striking plate of which shall be fixed to the first leaf.

Where indicated on the Drawings, doors shall be fitted with louvred ventilation grills of approved design, backed with insect and vermin-proof gauze screening.

(d) Steel window frames

All steel window frames shall comply with SABS 727 and shall be of the types and sizes shown on the Drawings.

Standard industrial types of steel window frames shall be constructed from rolled mild-steel industrial sections, 35 mm wide by 3 mm thick, with opening sections constructed from standard residential sections, 25 mm wide by 3 mm thick, welded at angles and properly jointed at intersections.

Window frames shall be formed perfectly flat, truly square and properly jointed at all angles, and the opening portion shall fit properly on all faces and shall open and close freely.

Glazing bars shall be continuous with jointed intersections, the ends being neatly tenoned into the frame and securely welded in position.

Frames shall be fitted with standard fixing lugs.

Opening sections shall open as indicated on the Drawings, and shall be fitted with steel hinges with brass pins. Pivots shall be fitted with bronze ring centres.

Side hung or top hung opening sections shall be fitted with brass handles and friction stays. Bottom hung sections shall be fitted with friction pivots and spring catches.

Weather bar drips shall be attached to the fixed frames for the complete width of the window at the head of outward opening sections.

Composite windows may either be delivered completely assembled with mullions and transoms or as separate units for assembly on the Site.

(e) Door locks and handles

All door locks shall comply with the requirements of SABS 4 and shall be of approved manufacture and pattern. All locks shall be supplied with two keys. Keys shall be distinctly numbered with consecutive numbers and each key shall be stamped with the same number as that of the lock which it controls. No two locks in any one building may have the same key.

External doors shall be fitted with four-lever heavy-duty mortice locks, which shall be master-keyed.

All locks shall be properly installed and, after completion, striker plates shall be adjusted and the locks serviced.

Door handles shall be of cast zinc of approved manufacture and pattern.

(f) Miscellaneous fittings

All retaining devices for doors and windows as well as fittings such as coat hooks, retaining hooks, etc, shall be of solid brass. All fittings shall be secured by screws or set screws of the same material and finish as the fitting.

Fittings to be fixed to plastered walls, masonry or floors shall be fixed direct by means of patent plastic or fibre plugs fitted into drilled holes.

Door stops shall be provided at every door and shall be 40 mm diameter rubber stops.

PB 03.2 **Installation of Doors and Windows**

All built-in door and window frames shall be set straight, plumb and level, and shall operate to the satisfaction of the Engineer after fixing has been completed.

Fittings shall be either removed, or wrapped and protected from damage, until all rough trades have been completed.

PB 04 **CARPENTRY AND JOINERY**

PB 04.1 **General**

(a) Materials

All timber used for structural purposes shall be of merchantable grade and shall comply with the requirements of SABS 563 and SABS 1245. Structural timber shall be carefully selected and of the best quality, free from large or dead knots, shakes, waney edges or other defects. Purlins and brandering shall comply with the requirements of SABS 653. Finger-jointed structural timber shall comply with the requirements of SABS 096 and laminated timber with the requirements of SABS 1089.

Hardwoods and softwoods for joinery shall comply with SABS 1099 and SABS 1359 respectively and suitable species shall be used for the various purposes.

Unless otherwise specified, all materials shall conform to the appropriate SABS or BS specification where such standards exist for nails, screws, bolts, adhesives, etc.

(b) Preservative treatment

All structural timber shall be given a preservative treatment suitable for the duty for which the timber is intended in accordance with SABS 05, and no untreated timber shall be used. The preservative treatment shall not impair the final finish. The timber shall be impregnated throughout. When surface coating is specified, the compounds applied on the surfaces of the timber shall form an unbroken film.

(c) Priming

The jointing surfaces of all joints exposed to the weather and built-in portions of frames shall be thickly primed except where adhesives are specified.
Carpentry and joinery items which are prepared for painting by the manufacturer, shall be knotted and primed before being dispatched to the Site.

Primed surfaces shall be touched up where necessary during the progress of the work or where Site adjustments have been made.

PB 04.2 **Carpentry Work**

(a) Scope of work

Carpentry work shall be carried out in a manner consistent with good workmanship and in compliance with the Drawings.

The carpenter shall perform all cutting away and making good in attendance upon all other trades and he shall provide and maintain temporary coverings required for the protection of any finished work that might be damaged if left unprotected during the progress of the work.

(b) Dimensions

Unwrought timber shall be as sawn and shall be to the dimensions and within the tolerances specified in the relevant SABS Standard Specifications mentioned in subclause PB 04.1(a).

(c) Jointing

Unless otherwise specified, all joints shall be secured by means of a suitable type and a sufficient number of approved connectors. All joints shall be carefully made in such a way that they will not impair the strength and stiffness of the beams or members.

(d) Timber roof construction

The plates, joists, rafters, purlins, brandering and other pieces used for the construction of the roof and trusses shall be of the dimensions, spacing and construction, as shown on the Drawings.

All the joints in the framework shall be of the most appropriate type, accurately formed and adequately secured with fasteners as specified.

PB 04.3 **Joinery Work**

(a) Scope of work

Joinery work shall consist of the manufacture, delivery to the Site, and fixing in the buildings, of all joinery shown on the Drawings.

Except where a special finish is specified, the Contractor shall have all stairs, landings, doors, shelves and other joinery work cleaned and scrubbed down and shall leave all his work in a good order to the satisfaction of the Engineer.

(b) Dimensions

All wrought timber shall be sawn, planed, drilled or otherwise machined or worked to the correct sizes and shapes shown on the Drawings.

Reasonable tolerance shall be provided at all connections between joinery works and the building structure to compensate adequately for any irregularities, settlements or any other movements.

(c) Fabrication

The joiner shall perform all the necessary mortising, tenoning, grooving, matching, tonguing, housing, rebating and all the other works necessary for correct jointing. He shall also provide all metal plates, screws, nails and other fixings that may be necessary for doing the specified joinery work properly.

(d) Joints

Where joints are not specifically indicated, they shall be the recognised forms of joints for each position. The joints shall be so made as to comply with part 2 of BS 1186.

(e) Doors and frames

Door frames, linings, panel doors, framed, ledged and braced doors, flush doors, sliding doors, etc, shall be supplied or made by the joiner and shall be installed, fitted or hung as detailed on the Drawings.

All timber shall be wrought and prepared for oiling, staining, varnishing or painting.

(f) Skirtings, cornices, etc

Skirtings, cornices, etc shall not be installed until after the wall coverings have been applied, the flooring laid and ceilings installed, unless otherwise specified.

(g) In situ joinery

In situ joinery work shall not be executed until after all floor, wall and ceiling surfaces have been formed or constructed, unless otherwise instructed.

(h) Ceilings

Ceilings shall consist of plaster board or fibre-cement panels as shown on the Drawings and shall be nailed to the brandering or suspended from the roof structure. The panels shall be separated by exposed tees and insulated with a 50 mm thick fibreglass wool blanket where shown on the Drawings.

PB 05 DOORS AND WINDOWS

PB 05.1 Materials

(a) General

All steel and iron work shall be delivered clean and free from rust, pitting or other defects. Shop priming shall be applied before delivery and shall consist of a coat of red oxide paint, or any other approved anti-rust paint on all surfaces.

Unless otherwise specified, all materials shall conform at least to the appropriate SABS or BS standards where such standards apply to ironmongery, steel, cast iron or any other related materials.

(b) Pressed steel door frames

Pressed steel door frames shall comply with SABS 1129 and shall be manufactured from 1,6 mm thick mildsteel sheeting, pressed to the required shapes, properly mitred, welded and reinforced, with all welding neatly cleaned off.

Frames shall be of the widths required to suit the thickness of the walls into which they are built and shall be fitted with suitable tie bars and braces at the bottom. Three lugs to be built into the brickwork shall be provided on each jamb.

Rebates in frames and transoms for doors shall be of the widths required to suit the thicknesses of the doors and shall be fitted with a pair of approved steel butt hinges set flush into recesses in the frames. 4,5 mm Thick reinforcing plates shall be welded to the backs of the frames at hinge positions.

Heads of frames over double doors shall be drilled where required to form keeps for bolts and shall be fitted with one rubber buffer for each leaf of the door.

Frames for single doors shall be fitted with approved chromium striking plates and an adjustable striking-plate keeper boxed in at the back of the frame by a welded-on sheet-metal box. The frames shall be fitted with a minimum of two rubber buffers.

Frames shall be protected against twisting and damage during transit and erection.

(c) Pressed-steel doors

Pressed-steel doors shall be manufactured from 1,6 mm thick steel plate. The doors shall be of standard design, pressed to shape with 40 mm reveals all round. The doors shall be strengthened with full-length vertical V-shaped or other approved sectional strengthening ribs projecting to the outer face. Two horizontal stiffening rails shall also be welded to the inner face of the doors.

A door shall be hung on a pair of 100 mm long steel butt hinges with loose pins. The leaves of the hinges shall be welded to both the door and the door frame, and a 1,6 mm thick steel plate shall be welded to the inner face of the door to protect the lock.

One leaf of double doors shall be fitted at the top and bottom with approved 150 mm cast brass barrel bolts in an approved manner and the other leaf shall be fitted with a lock, the striking plate of which shall be fixed to the first leaf.

Where indicated on the drawings, doors shall be fitted with louvred ventilation grills of approved design, backed with insect and vermin-proof gauze screening.

(d) Door locks and handles

All door locks shall comply with the requirements of SABS 4 and shall be of approved manufacture and pattern. All locks shall be supplied with two keys. Keys shall be distinctly numbered with consecutive numbers and each key shall be stamped with the same number as that of the lock which it controls. No two locks in any one building may have the same key.

External doors shall be fitted with four-lever heavy-duty mortice locks, which shall be master-keyed.

All locks shall be properly installed and, after completion, striker plates shall be adjusted and the locks serviced.

Door handles shall be of cast zinc of approved manufacture and pattern.

PB 05.2 **Installation of Doors and Windows**

All built-in door and window frames shall be set straight, plumb and level, and shall operate to the satisfaction of the engineer after fixing has been completed.
Fittings shall be either removed, or wrapped and protected from damage, until all rough trades have been completed.

PB 06 **ROOF SHEETING AND ACCESSORIES**

Roof sheeting and accessories shall comply with and will be measured and paid for under SABS 1200 HC.

PB 07 **PAINTING**

PB 07.1 **General**

No paint shall be applied to any surface containing traces of dust, grit, grease, oil, loose rust, millscale or corrosion products of any kind or to any surface that is not free from moisture. Where necessary, surfaces shall be thoroughly washed to remove all traces of soluble salts and/or corrosive air-borne contaminants prior to painting, and the surfaces shall be dried and painted immediately thereafter.

Welding shall be completed in so far as it is possible before painting commences, but in cases where welding can be done only at a later stage, no paint shall be applied to within 75 mm of the proposed weld position unless otherwise specified. Welds and adjacent parent metal shall be abrasive blasted and/or ground and all contaminants such as flux shall be removed prior to painting.

Surfaces of members which are to rest on concrete or other floors or which will be otherwise inaccessible after erection shall receive the full paint system prior to erection.

Damaged paint areas on metal surfaces shall be cleaned, rust spots removed where applicable and the surrounding paint which is still intact shall be feathered for a distance of 20 mm beyond the damaged area.

Spot priming and repair shall consist of all the coats previously applied and shall overlap the damaged area. Damaged galvanized areas shall be cleaned and any rust spots and any flakes of the coating surrounding the damaged area removed. The coating shall then be restored by zine spraying or soldering, or painting with a zinc-rich paint, as may be approved by the Engineer.

Where the shop coat is allowed to age for a few months before the final painting is done, light sanding or rubbing with steel wool or scrubbing with clean water using a bristle brush shall be carried out.

Steel to be embedded in concrete shall not be painted below 50 mm from the final level of the concrete.

Each priming coat and each undercoat of paint shall be inspected and approved by the engineer before any subsequent undercoat or finishing coat is applied.

All finishing colours shall be as shown on the drawings, or as directed by the engineer.

PB 07.2 **Materials**

Paints shall comply with the requirements of the appropriate specifications below:

(a) Primers

SABS 678 : For wood
SABS 679 : Zinc chromate for steel
SABS 723 : Etch-wash primer for metals
SABS 912 : Calcium plumbate for galvanized iron

(b) Undercoats

SABS 681 : For all undercoats

(c) Finishing coats

SABS 515 : For interior use, flat and egg-shell finish
SABS 630 : For interior and exterior use, high-gloss enamel
SABS 631 : For interior and exterior use, oil gloss paint
SABS 633 : For interior use, emulsion paint
SABS 634 : For exterior use, emulsion paint
SABS 684 : For exterior use on structural steel
SABS 801 : For interior and exterior use, epoxy-tar paint
SABS 802 : For interior and exterior use, bituminous aluminium paint
SABS 887 : For interior use, glossy and egg-shell varnish.

The contractor shall furnish the engineer with the following information and details regarding the paints and decorative materials for the painting system he proposes to use, for written approval:

(i) The name of the manufacturer and trade name.

(ii) The brand, type or grade of paint and the appropriate SABS specification.

(iii) Manufacturer's data sheets, colour references, instructions for use, including surface preparation, sealers, primers, undercoats, finishing coats, coat thicknesses and curing periods, which shall all be considered as being part of these specifications if approved by the engineer.

(iv) Safeguards to protect the applied paint from damage until the work is accepted by the engineer.

(v) The shelf or pot life of materials, if applicable.

(vi) An undertaking that the proposed paint system is suitable for its intended use and that the various coats of paint are compatible with one another.

Where proprietary brands are used, the manufacturer's priming and all subsequent coats of paint suitable for that particular brand shall be employed in accordance with the manufacturer's instructions.

No other materials of a similar nature and quality or from another manufacturer may be used instead of those approved unless permission to do so has been obtained from the engineer, in writing.

All materials shall be brought onto the site in containers scaled by the manufacturer. Paints shall not be mixed with another paint of a different quality, type, brand or colour, or thinned or adulterated in any way, but shall be used as supplied by the manufacturer. Any mixing or tinting required shall be carried out by the manufacturer.

Tinting of paint on the site by the contractor will only be allowed with the written permission of the manufacturer and the engineer.

PB 07.3 **Inspection and Preliminary Work**

Before commencing paintwork, the contractor shall carefully inspect the surfaces to be painted to satisfy himself that the surfaces are in a satisfactory or acceptable condition to receive the paint system specified.

All metal fittings and fastenings shall be removed where applicable before the preparatory processes are commenced. On completion, the metal fittings and fastenings shall be cleaned and refitted in position.

PB 07.4 **Workmanship and Finishes**

Paint may be applied by spray, brush or roller depending on the materials used, the surface to be painted, and the manufacturer's instructions.

Every coat of paint, irrespective of the method of application, shall be adequately and permanently keyed or bonded to the base material or previously applied coat, and shall be evenly distributed, continuous, free from sags, runs, brush marks, pin holes or other imperfections, and shall dry to a smooth finish.

An approved water trap and air-regulating valve shall be furnished and installed on all equipment used in spray painting.

Before painting the interiors of buildings they shall be cleaned and the floors shall be washed and kept free from dust during the progress of the interior work.

The contractor shall protect all nearby surfaces against disfigurement by spatters, splashes and smirches of paint or paint materials. The contractor shall be responsible for any damage by paint or dirt caused by his operations to vehicles or property or injury to persons and he will be required to provide protective measures to prevent any such damage or injury and make good, where required, at his own expense.

If passing traffic creates dust, which may harm or spoil the appearance of external painted surfaces, the contractor shall sprinkle the adjacent areas with water, at his own cost, for a sufficient distance on each side of the location where painting is being done.

Undercoats shall be tinted by the manufacturer to distinguish between successive coats.
The final coats or finishing coats of paint shall be applied after all the other work in the vicinity has been completed.

The painter shall keep some of the final paint in reserve in the event of his having to make good any patching which may be required as a result of damage or unforeseen circumstances.

Upon completion, the contractor shall, in the case of buildings, clean all glass, remove all paint spots from walls, floors and fittings, and leave the premises clean and fit for occupation.

All inflammable materials, comprising solvents, thinners, wiping cloths, etc, shall be placed in tightly closed containers and properly disposed of.

PB 07.5 **Painting of Metal Surfaces**

(a) General

Wherever possible, all painting shall be done at the fabricator's works, but where this is not feasible, the engineer may permit the application of the undercoat and finishing coats to be carried out on the site, in which case a prime coat shall be applied at the fabricator's works prior to the members being despatched to the works.

(b) Surface preparation

The preparation of metal surfaces shall comply with SABS Code of Practice 064 and shall receive the greatest care to ensure rust-free conditions prior to the paint system being applied.

All surfaces shall be prepared by loose paint, rust plaster, scale, dust, dirt, grease, etc, being removed and by the defective paint surfaces being repaired or patched before painting or repainting. Damaged shop-primed surfaces shall be thoroughly cleaned of rust and patched with a prime coat.

(c) Paint application

(i) Iron and steel work

All iron and steel work shall be properly primed with a red-lead-based primer where steel work is likely to be exposed to the elements for longer than 30 days. Zinc-chromate primer may be used where overpainting will be completed within 30 days of priming. Metal-etch wash primers may be used under dry conditions where overpainting will be completed within 24 hours of priming. The dry-film thickness of the prime coat shall not be less than 0,300 mm.

After priming, one coat of universal undercoat shall be applied. If necessary, the undercoat shall be tinted to a shade just lighter than the desired finish with approved liquid stainers. The dry-film thickness shall not be less than 0,250 mm.

The two finishing coats shall either be of alkyd resin-based synthetic enamel, gloss or matt oil paint, or as specified elsewhere. The dry-film thickness shall not be less than 0,250 mm per coat.

When mating surfaces are brought together, both surfaces shall have been given the full treatment specified, but where this cannot be done, each surface shall be given a copious coating of primer and the surfaces drawn together while the paint is still wet.

The surfaces of steel and cast-iron articles, such as floor gratings, grids and manhole covers, shall, after a thorough brushing to remove loose rust, be painted with two coats of epoxy-tar paint, each at least 0,230 mm thick.

(ii) Galvanized iron and steel

All traces of protective coating shall be removed with galvanized iron cleaner, and two coats of calcium plumbate primer shall be applied. One coat of tinted universal undercoat and two finishing coats of alkyd resin-based synthetic enamel gloss paint shall be applied.

PB 07.6 **Paint Thickness**

Unless otherwise specified, all coats of paint, whether prime coat, undercoat or finishing coat, shall have a dry-film thickness of not less than 0,200 mm, irrespective of the method of application.

PB 07.7 **Inspection**

The contractor shall provide the necessary equipment to establish whether the primers, undercoats and finishing coats have been applied to the correct thickness and at the correct applications. The engineer may take samples of the paints during painting operations for testing and quality control.

PB 08 **MEASUREMENT AND PAYMENT**

PB 08.1 **Brickwork**

(a) (Thickness, type and class indicated) ..... **Unit : m²**

(b) Etc for other thicknesses, types and classes

The unit of measurement shall be the square metre of each type of brickwork built, calculated from the leading dimensions of the brickwork. Areas of pipes, etc, built into brickwork shall not be included in the areas measured. At corners and intersections common to more than one brick wall, the areas shall be measured only once.

The tendered rates shall include full compensation for the construction of the brickwork complete as specified, including pointing, the building-in of conduits, beams, lintels, pipe sleeves, doors, windows, the raking-out of joints, damp-proof course, brickforce reinforced as specified, etc.

PB 08.2 **Plaster Work**

(a) (Thickness of plaster and finish indicated) ..... **Unit : m²**

(b) Etc for other thicknesses and finishes

The unit of measurement shall be the square metre of each type of coat completed as specified.

The tendered rates shall include full compensation for the construction of the plaster work, including the supply of all materials, mixing, applying, finishing, forming reveals, joints, narrow widths, rounded angles, v-joints, etc, complete as specified.

PB 08.3 **Doors and Windows**

(a) (Type and size indicated) ..... **Unit : No**

(b) Etc for other types and sizes

The unit of measurement shall be the number of doors and windows installed complete as specified.

The tendered rates shall include full compensation for the manufacturing and installation of the steel doors, windows, and frames complete with hinges, handles, locks, barrel bolts, retaining devices, door stops, stays and any other work necessary to complete the work as specified or as shown on the drawings. The tendered rate for windows shall also include full compensation for glazing, window sills as specified, and damp-proof sheeting.

PB 08.4 **Structural Timber**

(a) Plates (sizes indicated) ..... **Unit : m**

(b) Rafters (sizes indicated) ..... **Unit : m**

(c) Purlins (sizes indicated) ..... **Unit : m**

The unit of measurement shall be the metre of individual types of timber elements or number of complete trusses installed.

The tendered rates shall include full compensation for the supply of all materials, manufacture, cutting, waste, jointing and installation of the timber as shown on the drawings.

PB 08.5 **Miscellaneous Work**

(a) Paintwork ..... **Unit : sum**

The tendered sums shall include full compensation for supply all materials, for transport, for storage, for all equipment and labour, for all temporary work and safety precautions, for replacing defective work, for protecting completed work and for cleaning up after completion.

(b) Refurbishment work of structure as shown on drawings ..... **Unit : sum**

The tendered sums shall include full compensation for supply all materials, for transport, for storage, for all equipment and labour, for all refurbishment work of existing structure as shown on the drawings complete.

(c) Supply of miscellaneous items ..... **Unit : sum**

Various items shall be scheduled

The tendered rate shall make full compensation to provide the item scheduled (or as shown on the drawings) complete.

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GONDWANA GEO SOLUTIONS

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Report to Lyners Consulting Engineers
Geotechnical Investigation for the Proposed Upgrade of Bonnievale Water Treatment Works, Western Cape

Project No.: 25-130R01

Date Issued: February 2026

Report to Lyners Consulting Engineers
Geotechnical Investigation for the Proposed Upgrade of Bonnievale Water Treatment Works, Western Cape

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Report to Lyners Consulting Engineers
Geotechnical Investigation for the Proposed Upgrade of Bonnievale Water Treatment Works, Western Cape

1. INTRODUCTION

Gondwana Geo Solutions (Pty) Ltd (or GGS) was requested by Mr Henri Blignaut of Lyners Consulting Engineers to provide a cost estimate for a geotechnical investigation for the proposed upgrade of the Water Treatment Works in Bonnievale, Western Cape. The cost estimate was submitted to Mr Blignaut who subsequently appointed GGS on the 21st November 2025 to proceed with the investigation as proposed.

As required in the scope of works, five trial pits were dug at positions indicated by Mr Blignaut in the RFQ document. Dynamic probe light (DPL) tests were also carried out adjacent to each trial pit. The trial pits were logged and sampled. Laboratory testing was carried out on selected samples.

This report contains the results of the geotechnical investigation as well as recommendations for excavation requirements, lateral support, foundations, groundwater and materials classification and usage.

2. INFORMATION SUPPLIED

The following information was provided electronically for use in the investigation:

- Google Earth KMZ showing required test positions: titled: *'24203 – RFQ for Geotech.kmz'*
- RFQ document C24203/COR/ML/hb/02, by Neil Lyners and Associates (Pty) Ltd

3. SITE DESCRIPTION

The site is situated at and adjacent to the existing Bonnievale Water Treatment Works plant. The site has two parts, firstly near the southeastern edge of the plant boundary where the new transfer pump station is to be located, and secondly, west of the plant on the adjacent, open land where the new chlorine contact tank, gravity filters and backwash pump station are to be located.

Near the existing plant, the site is located on a gentle slope at the boundary near the fence. On the new planned area to the west, the site is flat and has been levelled. This portion of the site slopes steeply further to the south along the boundary.

Vegetation is not present near the plant, however, some trees along the boundaries to the western portion are present.

The following plates provide a more detailed perspective of the site.









Plates 1 to 4: General perspectives of the site

The site layout is shown in Figure 1 below.

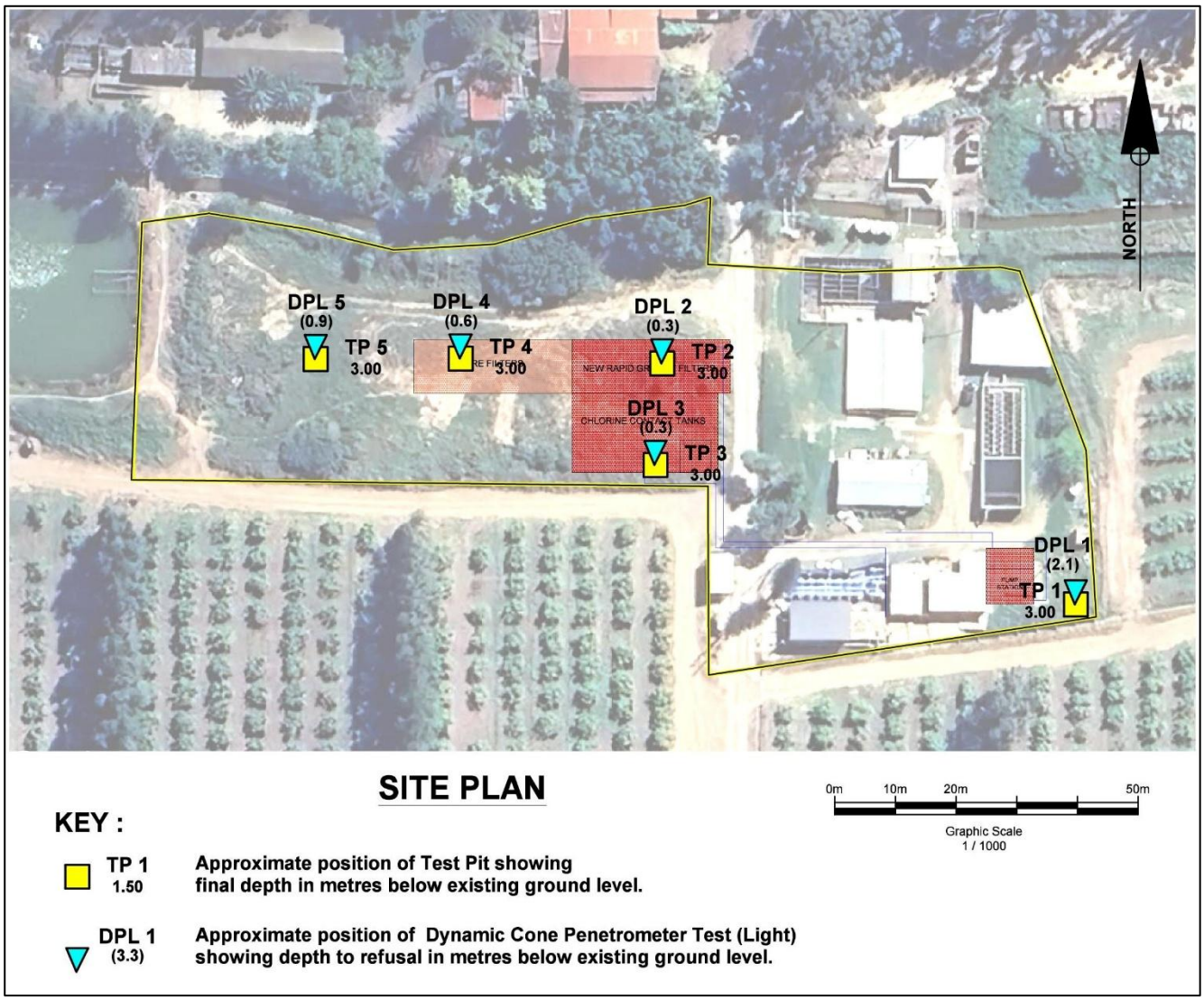


Figure 1: General layout of the site including geotechnical test positions

4. FIELDWORK

The fieldwork was carried out on the 8th December 2025 and comprised the following:

- Test pits, and
- Dynamic Cone Penetrometer Light (DPL) tests

The positions of the above tests are shown in Figure 1 above.

4.1 Test Pits

Five test pits, designated TP1 to TP5, were excavated using a CAT 428F TLB at the approximate positions shown in Figure 1 to allow soil identification and sampling of the insitu material. The test positions for TP1, TP2, TP3, and TP5 were indicated for excavation by the client.

The test pits were dug to final depths of 3.50 metres below existing ground level (mbegl).

The test pits were profiled[1] by an Engineering Geologist and representative soil samples were recovered for later laboratory testing.

The detailed logs are attached in Appendix A and summarised in Table 1 below.

Table 1
Summary of Test Pit Details

TP No.	Depth (mbegl)	Comments
TP1	3.50	0.00-1.20m: Dry brown loose to medium dense intact silty gravelly fine to coarse SAND with occasional cobble and frequent rubble. Fill. 1.20-3.00m: Dry brown stiff becoming very stiff with depth intact clayey sandy SILT. Residual Siltstone. **Final depth at 3.50m.** **No groundwater seepage.** **No sidewall collapse.**
TP2	3.50	0.00-1.00m: Dry greyish brown stiff intact clayey sandy SILT with abundant siltstone / shale boulders (500-1000mm) and rubble throughout. Fill 1.00-3.00m: Dry brown stiff becoming very stiff with depth intact clayey sandy SILT. Residual Siltstone. **Final depth at 3.50m.** **No groundwater seepage.** **No sidewall collapse.**
TP3	3.50	0.00-1.10m: Dry greyish brown stiff intact clayey sandy SILT with abundant siltstone / shale cobble and boulders (450-850mm) and rubble throughout. Fill 1.10-3.00m: Dry brown stiff becoming very stiff with depth intact clayey sandy SILT. Residual Siltstone. **Final depth at 3.50m.** **No groundwater seepage.** **No sidewall collapse.**
TP4	3.50	0.00-0.50m: Dry dark brown stiff intact clayey sandy SILT with occasional siltstone cobble, boulders and rubble. Fill 0.50-3.00m: Dry brown stiff becoming very stiff with depth intact clayey sandy SILT. Residual Siltstone. **Final depth at 3.50m.** **No groundwater seepage.** **No sidewall collapse.**
TP5	3.50	0.00-0.10m: Dry dark brown stiff intact clayey sandy SILT with occasional siltstone cobble, boulders and rubble. Fill 0.10-3.00m: Dry brown stiff becoming very stiff with depth intact clayey sandy SILT. Residual Siltstone. **Final depth at 3.50m.** **No groundwater seepage.** **No sidewall collapse.**

Note: mbegl = metres below existing ground level

[1] Guidelines for Soil and Rock Logging in South Africa, *Proceedings, Geoterminology Workshop organised by AEG, SAICE and SAIEG*, 1990






Plates 5 to 8: TP2 to TP5: Bouldery fill overlying stiff residual siltstone soils

4.2 Dynamic Cone Penetrometer Light (DPL) tests

Five Dynamic Cone Penetrometer (Light), or (DPL), tests, designated DPL1 to DPL5, were carried out at the approximate positions shown in Figure 1 to determine the consistency of the soils underlying the site and possible depth to bedrock or a competent founding substrate.

The DPL test comprises a 25mm diameter solid steel retractable cone driven vertically into the ground using a 10 kg hammer dropped through a height of 550mm. The resistance to penetration is measured in terms of number of blow counts per 300mm advance. The DPL test can refuse on boulders, cemented layers as well as bedrock. Due to the nature of the test no soil samples are recovered from the DPL equipment.

The DPL tests were advanced to refusal depths of between 0.30 and 2.10 mbegl.

The results of the DPL tests, consisting of blow count and inferred consistency against depth are attached in Appendix B and summarised in Table 2 below.

Table 2
Summary of DPL Test Results

DPL No.	Depth (mbegl)	Comments
DPL1	2.10	Medium dense to 0.30m Loose to 0.60m Medium dense to 1.20m Firm to 1.50m Stiff to 2.10m Refusal
DPL2	0.30	Stiff to 0.30m Refusal
DPL3	0.30	Stiff to 0.30m Refusal
DPL4	0.60	Stiff to 0.30m Very stiff to 0.60m Refusal
DPL5	0.90	Stiff to 0.60m Very stiff to 0.90m Refusal

Note: mbegl = metres below existing ground level

5. SITE GEOLOGY

The geology beneath the Bonnievale Water Treatment Works site is shown by the relevant geological map[2] (Figure 2). It consists of transported soils (alluvium) overlying the sedimentary rocks (siltstones, shales, and sandstones) of the Adolphspoort Formation, Bidouw Subgroup, of the Bokkeveld Group.

The results of the fieldwork indicate that the site is underlain by a layer of fill which overlies residual siltstone soils. The residual soils extend to depths greater than 3.5m.

[2] 1:250 000 Geological Map Series 3218 Clanwilliam published by the Council of Geosciences

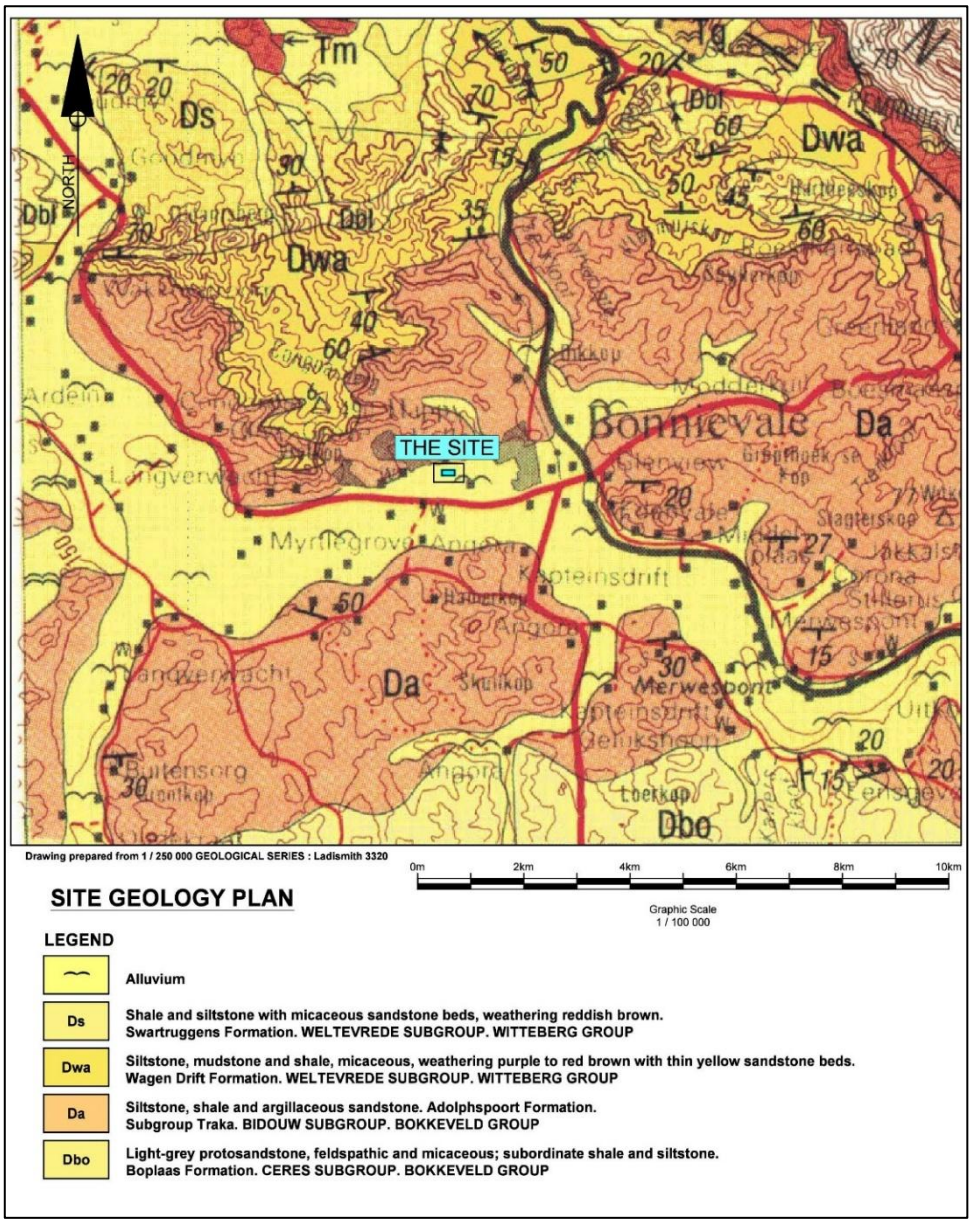


Figure 2: Regional Geology

In summary, the following typical geological profile can be inferred for the site:

Depth (m) **Inferred Geology**

For TP1: Transfer Pump Station

0.00-1.20m: Dry brown loose to medium dense intact silty fine to coarse SAND with occasional cobble, gravel and rubble. Fill

1.20-3.50m: Dry brown firm to stiff becoming very stiff with depth intact clayey sandy SILT. Residual Siltstone.

From the results of the DPL tests the following general trend in soil consistency can be expected:

Medium dense to 0.30m
Loose to 0.60m
Medium dense to 1.20m
Firm to 1.50m
Stiff to 2.10m

For TP2 to TP5: Chlorine Contact Tank, Gravity Filters and Backwash Pump Station

0.00-0.50m: Dry dark brown stiff intact clayey sandy SILT with occasional siltstone cobble, boulders and rubble. Fill
0.50-3.50m: Dry brown stiff becoming very stiff with depth intact clayey sandy SILT. Residual Siltstone.

From the results of the DPL tests the following general trend in soil consistency can be expected:

Stiff to 0.30m
Very stiff to 0.60m

Note:
No colluvium (i.e. transported soil horizon) was identified between the fill and residual soils. The absence of this entire horizon beneath the site suggests that the original ground levels were altered when the better quality colluvial soils were borrowed for construction, probably for the construction of the WWTW. Once the material had been borrowed, the area was then used for the dumping of spoiled fill materials.

No bedrock was confirmed in the current investigation.

6. GROUNDWATER

No groundwater seepage was encountered in any of the test pits or on the DPL rods put down on site.

Note that it can generally be expected that during and after the wet season and heavy rainfalls perched groundwater seepage zones will occur at the interface between the fill and the underlying residual soils and / or bedrock.

7. LABORATORY TESTING AND MATERIALS EVALUATION

7.1 Materials Usage

To classify materials and to assess their suitability for the construction of earthworks, pipe bedding materials and roads, the following laboratory testing was conducted on soils taken from the test pits.

- Foundation Indicator tests (Particle Size Analysis, Atterberg Limit Determination and Hydrometer Analysis),
- Mod AASHTO dry density tests, and
- California Bearing Ratio tests

The results of the laboratory tests are provided in Appendix C and summarised in Table 3 below.

Table 3
Summary of Results of Particle Size Distribution Analysis, Atterberg Limit Determinations and CBR tests

TP No.	Depth (m)	Description	Particle Size %				Atterberg Limits			GM	Insitu Moisture Content (%)	Modified AASHTO		CBR Values (%) Compaction MDD (%)					Swell (%)	Classification & Activity
			Clay	Silt	Sand	Gravel	LL	PI	LS %			MDD (kg/m³)	OMC %	90	93	95	98	100		
TP1	0.00-1.20	Dry brown loose to medium dense intact silty gravelly fine to coarse SAND with occasional cobble and frequent builders rubble. Fill.	3	19	41	37	22.4	7.4	3.7	1.84	1.4	1955	12.3	3	4	6	8	10	2.09	A-2-4; SC; <G9; Low heave; Type E Gravel Wearing Course
TP4	1.10-3.00	Dry brown stiff becoming very stiff with depth intact clayey sandy SILT. Residual Siltstone.	12	33	51	5	24.1	9.1	4.5	0.94	11.6	2128	9.5	4	5	7	9	11	2.17	A-5(0); CL; <G9; Low heave; Type D Gravel Wearing Course

LL - Liquid Limit
PI - Plasticity Index
LS - Linear Shrinkage
GM - Grading Modulus
MDD - Maximum Dry Density
OMC - Optimum Moisture Content

Classification in Terms of:
AASHTO Soil Classification System [3]
Unified Soil Classification System[4]
COLTO[5]
Van der Merwe[6]
TRH20 (1990)[7]

Suitability for Gravel Wearing Course
A - Erodible Materials
B - Ravels and Corrugates
C - Ravels
D - Slippery when Wet
E - Good

[3] AASHTO Soil Classification System (from AASHTO M 145 or ASTM D3282): American Association of State Highway and Transportation Officials
[4] ASTM D 2487-06 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). June 2006
[5] COLTO Standard Specifications for Road and Bridge Works for State Road Authorities (1998)
[6] Van der Merwe, D M 1964. The prediction of heave from the plasticity index and percentage clay fraction of soils. *The Civil Engineer in South Africa*, 6(6): 103–107
[7] TRH20 (1990) - The Structural Design, Construction and Maintenance of Unpaved Roads, Committee of State Road Authorities

8. DEVELOPMENT RECOMMENDATIONS

8.1 Proposed Development

The proposed upgrade to the Bonnievale Water Treatment Works will comprise the following:

- New Transfer Pump Station and Transfer Sump
- New Rapid Gravity Filters x 8
- New Chlorine Contact Tank
- New Backwash Pump Station and Chlorine Dosing
- Likely Future Filters near backwash pump station

8.2 Excavation Requirements

An indication of the depth to which Soft Excavation[8] material occurs is obtained from the final depths of the test pits TP1 through TP5 carried out for the fieldwork. Soft Excavation to a depth of at least 3.5 metres below existing ground level may be allowed for.

Unsupported excavation sidewalls up to 1.2m depth must be battered back with slopes not steeper than 1V to 1.5H, space permitting. The stability of open excavations will be affected by wet weather and the resultant shallow groundwater conditions. It may be necessary to flatten batters further in this case.

Excavations deeper than 1.2m should be supported.

Dewatering may be required for all excavations taken below the ambient groundwater level.

Daily excavations must be conducted by a competent person to confirm that excavations are safe for entry.

8.3 Site Materials

The results of the laboratory tests yielded the following:

Fill

Material Characteristics

- Soil composition: Brown loose to medium dense intact silty gravelly fine to coarse SAND
- Clay content: 3%
- Silt content: 19%
- Sand content: 41%
- Gravel content: 37%
- Plasticity Index: 7.4
- Grading Modulus value of 1.84
- Compaction and materials strength:
  - MDD: 1955kg/m^3
  - OMC: 12.3%
  - CBR values:
    - CBR @ 90% MDD 3
    - CBR @ 93% MDD 4
    - CBR @ 95% MDD 6
    - CBR @ 98% MDD 8
    - CBR @ 100% MDD 10
    - CBR Swell @ 100% MDD 2.09
- Classifications: A-2-4 in terms of the AASHTO system and SC in terms of the Unified Soil Classification System
- Less than G9 quality due to high CBR swell (i.e. >1.5%)
- TRH20 gravel wearing course classification: Type E (Good)

[8] SANS634:2012: Geotechnical Investigations for Townships: pp16, Table 5 - Classification of material for machine excavation

Recommended Usage:

- This material is suitable for use as a general fill and landscaping only.
- It is not suitable for the following:
  - structural fill
  - bedding or backfill to pipelines
  - use in construction of road layerworks or paved areas
- It is suitable for use as a gravel wearing course on unpaved roads

Residual Siltstone

Material Characteristics

- Soil composition: Brown stiff becoming very stiff with depth intact clayey sandy SILT
- Clay content: 12%
- Silt content: 33%
- Sand content: 51%
- Gravel content: 5%
- Plasticity Index: 9.1
- Grading Modulus value of 0.94
- Compaction and materials strength:
  MDD: 2128kg/m^3
  OMC: 9.5%
  CBR values:
  - CBR @ 90% MDD 4
  - CBR @ 93% MDD 5
  - CBR @ 95% MDD 7
  - CBR @ 98% MDD 9
  - CBR @ 100% MDD 11
  - CBR Swell @ 100% MDD 2.17
- Classifications: A-5(0) in terms of the AASHTO system and CL in terms of the Unified Soil Classification System
- Less than G9 quality
- TRH20 gravel wearing course classification: Type D (Slippery when wet)

Recommended Usage:

- This material is suitable for use as a general fill and landscaping only.
- It is not suitable for the following:
  - structural fill
  - bedding or backfill to pipelines
  - use in construction of road layerworks or paved areas
- It is suitable for use as a gravel wearing course on unpaved roads, but slippery when wet.

8.4 Foundations

Mr Blignaut indicated that details regarding the loading, depth of founding or size area of the various structures are currently unavailable, as the design process is still underway. The recommendations given below are therefore general in nature, subject to review when all information is at hand.

The absence of a transported colluvial layer beneath the site indicates that the original ground levels were altered by borrowing of the colluvial soil horizon. Thereafter fill was placed i.e. dumping of spoiled fill materials not suitable for construction use, over the exposed residual soils

8.4.1 New Transfer Pump Station and Transfer Sump

From the results of the DPL tests, test pits and the laboratory results in Table 3 above, the upper 1.2m of fill material is both too variable in composition and of poor consistency to provide suitable founding.

It will be necessary to strip all the fill material away from the site and found in the residual shale material of stiff consistency where a maximum allowable bearing pressure of 120kPa may be adopted.

8.4.2 Chlorine Contact Tank, Gravity Filters and Backwash Pump Station

The locations of these structures are underlain by a mantle of fill material of average 0.9m thick, in the range 0.1 to 1.2m. From the results of the DPL tests, test pits and the laboratory results in Table 3 above, the fill material is both too variable in composition and of poor consistency to provide suitable founding.

It will be necessary to found all structures on the underlying residual shale material where a maximum allowable bearing pressure of 120kPa may be adopted.

Where shallower founding is desirable then a suitable fill material of at least G7 quality should be imported to the site and placed as an engineered soil mattress over the residual soil surface. The thickness of the soil mattress will depend on the platform levels of the specific structure.

It is recommended that GGS inspect and approve the excavation to confirm depth of founding and bearing pressure.

8.5 Retaining Walls

The fill and residual siltstone material is not suitable for use as backfill behind retaining walls. A suitable material of G7 quality should be imported to the site for this purpose.

8.6 Subgrade Treatment - Roads and Parking Areas

All insitu materials are of very poor subgrade quality of less than G9 / G10 (TRH14) and will not be suitable for use in road construction. Therefore, they should be undercut or boxed out where they occur below the top of subgrade and replaced with a good quality material, such as a G7 material imported to site. A minimum undercut of 300mm should be aimed for (or as per requirements of the Design Engineer).

8.7 Recommended Good Building Practice

The following good building practice is recommended:

- All structures should have a concrete or paved surround minimum width 1m with falls to promote drainage away from the walls and thus prevent surface water gaining ingress into the foundation soils.
- No effluent, sewage or stormwater soak pits should be positioned within 3m of any structure.
- No trees, flower beds or garden irrigation systems should be established within 3m of any structure.

9. CONCLUSIONS

This report contains the results of a geotechnical investigation carried out for the proposed upgrade of the Water Treatment Works in Bonnievale, situated in the Cape Winelands District Municipality.

The proposed upgrade will comprise the following new works:

- New Transfer Pump Station and Transfer Sump
- New Rapid Gravity Filters x8
- New Chlorine Contact Tank
- New Backwash Pump Station and Chlorine Dosing
- Likely Future Filters near backwash pump station

The findings of the geotechnical investigation are presented.

The site geology consists of a layer of fill overlying residual siltstone soils. The absence of a natural colluvial or transported soil horizon suggests that it, being of suitable quality, was borrowed for construction use of the WWTW. Thereafter the area was used to dump spoil material of relatively poor quality.

No bedrock was confirmed in the current investigation.

Recommendations are given for earthworks, excavations, foundations, materials usage and subgrade treatment.

Materials of suitable quality for roads, paved areas, pipe and cable bedding, and structural fill use will need to be imported to site.

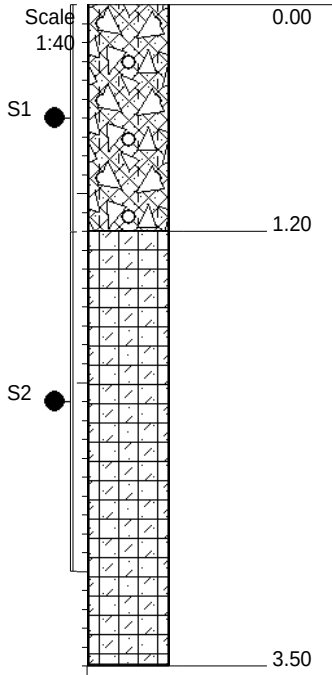
Finally, the ground conditions described in this report refer specifically to those encountered in the trial pits and DPL tests done on site. It is therefore quite possible that conditions at variance with those discussed above can be encountered elsewhere. It is therefore important GGS carry out periodic inspections of the earthworks and open foundation excavations. Any change from the anticipated ground conditions can then be taken into account to avoid unnecessary expense.

APPENDIX A

LYNERS CONSULTING ENGINEERS
Upgrade of Bonnievale Water Treatment Works

HOLE No: **TP1**
Sheet 1 of 1

JOB NUMBER: 25-130



0.00 Dry brown loose to medium dense intact silty gravelly fine to coarse SAND with occasional cobble and frequent rubble. Fill.

1.20 Dry brown stiff becoming very stiff with depth intact clayey sandy SILT. Residual Siltstone.

3.50

NOTES

1) Final depth at 3.50m.
2) No groundwater seepage.
3) No sidewall collapse.
4) Samples taken :
   S1 0.00--1.20m (3 x Bulk)
   S2 1.20--3.00m (3 x Bulk)

CONTRACTOR :
MACHINE : CAT 428F TLB
DRILLED BY :
PROFILED BY : SR

INCLINATION :
DIAM :
DATE : 08/12/2025
DATE : 08/12/2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP1**

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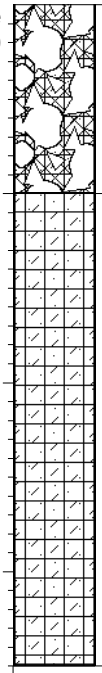
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LYNERS CONSULTING ENGINEERS
Upgrade of Bonnievale Water Treatment Works

HOLE No: **TP2**
Sheet 1 of 1

JOB NUMBER: 25-130

Scale 1:40



0.00 Dry greyish brown stiff intact clayey sandy SILT with abundant siltstone / shale boulders (500-1000mm) and rubble throughout. Fill.

1.00 Dry brown stiff becoming very stiff with depth intact clayey sandy SILT. Residual Siltstone.

3.50

NOTES

1) Final depth at 3.50m.
2) No groundwater seepage.
3) No sidewall collapse.
4) No samples taken.

CONTRACTOR :
MACHINE : CAT 428F TLB
DRILLED BY :
PROFILED BY : SR

TYPE SET BY : MC
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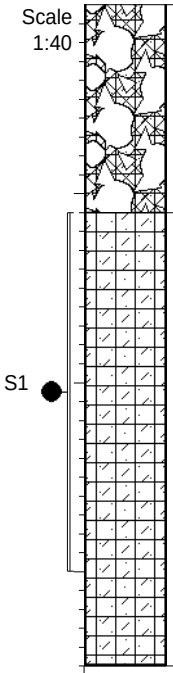
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Y-COORD :

HOLE No: **TP2**

LYNERS CONSULTING ENGINEERS
Upgrade of Bonnievale Water Treatment Works

HOLE No: **TP3**
Sheet 1 of 1

JOB NUMBER: 25-130



0.00 Dry greyish brown stiff intact clayey sandy SILT with abundant siltstone / shale cobble and boulders (450-850mm) and rubble throughout. Fill.

1.10 Dry brown stiff becoming very stiff with depth intact clayey sandy SILT. Residual Siltstone.

3.50

NOTES

1) Final depth at 3.50m.
2) No groundwater seepage.
3) No sidewall collapse.
4) Samples taken :
   S1 1.10--3.00m (3 x Bulk)

CONTRACTOR :
MACHINE : CAT 428F TLB
DRILLED BY :
PROFILED BY : SR

INCLINATION :
DIAM :
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DATE : 08/12/2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP3**

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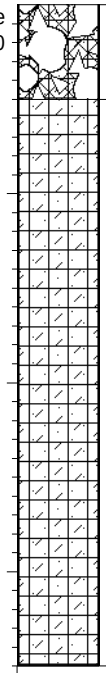
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LYNERS CONSULTING ENGINEERS
Upgrade of Bonnievale Water Treatment Works

HOLE No: **TP4**
Sheet 1 of 1

JOB NUMBER: 25-130

Scale 1:40



0.00 Dry dark brown stiff intact clayey sandy SILT with occasional siltstone cobble, boulders and rubble. Fill.

0.50 Dry brown stiff becoming very stiff with depth intact clayey sandy SILT. Residual Siltstone.

3.50

NOTES

1) Final depth at 3.50m.
2) No groundwater seepage.
3) No sidewall collapse.
4) No samples taken.

CONTRACTOR :
MACHINE : CAT 428F TLB
DRILLED BY :
PROFILED BY : SR

TYPE SET BY : MC
SETUP FILE : GGS-ST~2.SET

INCLINATION :
DIAM :
DATE : 08/12/2025
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ELEVATION :
X-COORD :
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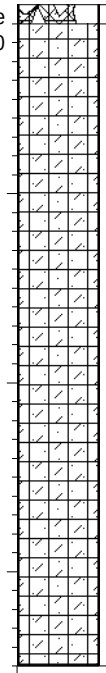
HOLE No: **TP4**

LYNERS CONSULTING ENGINEERS
Upgrade of Bonnievale Water Treatment Works

HOLE No: **TP5**
Sheet 1 of 1

JOB NUMBER: 25-130

Scale 1:40



0.00 Dry dark brown stiff intact clayey sandy SILT with occasional siltstone cobble, boulders and rubble. Fill.

0.10 Dry brown stiff becoming very stiff with depth intact clayey sandy SILT. Residual Siltstone.

3.50

NOTES

1) Final depth at 3.50m.
2) No groundwater seepage.
3) No sidewall collapse.
4) No samples taken.

CONTRACTOR :
MACHINE : CAT 428F TLB
DRILLED BY :
PROFILED BY : SR

TYPE SET BY : MC
SETUP FILE : GGS-ST~2.SET

INCLINATION :
DIAM :
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DATE : 08/12/2025

DATE : 06/02/2026 09:07
TEXT : ..evaleWTW\Logs\TP1TP5.doc

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP5**

APPENDIX B

GONDWANA GEO SOLUTIONS

Consulting Geotechnical Engineers & Engineering Geologists

Cape Town Office:
13 Rocklands Road
Simonstown
CAPE TOWN
7975

Client: LYNERS CONSULTING ENGINEERS
Project: Upgrade of Bonnievale Water Treatment Works
Section:

Ref.No. 25-130
Date: 08/12/2025
Operator: PT

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 1***

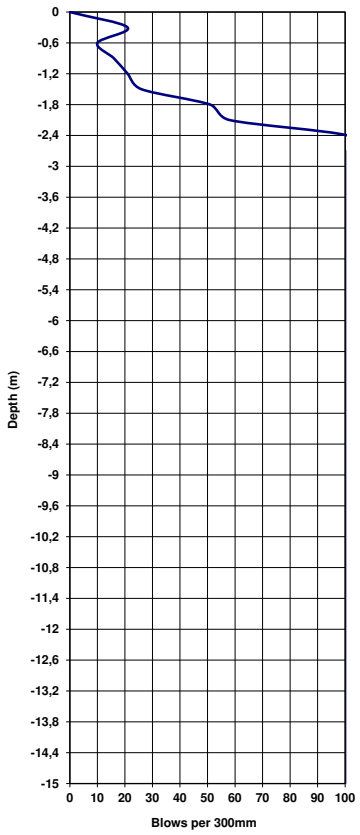
Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 2***

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 3***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

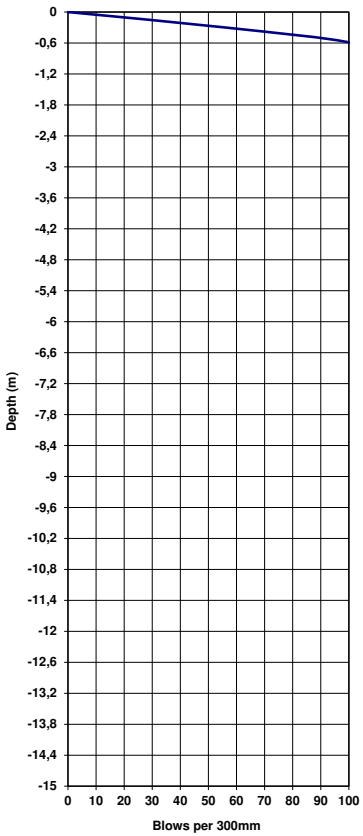
Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	21	Med.Dense
0,6	10	Loose
0,9	16	Med.Dense
1,2	21	Med.Dense
1,5	26	Firm
1,8	51	Stiff
2,1	58	Stiff
	Ref	



Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

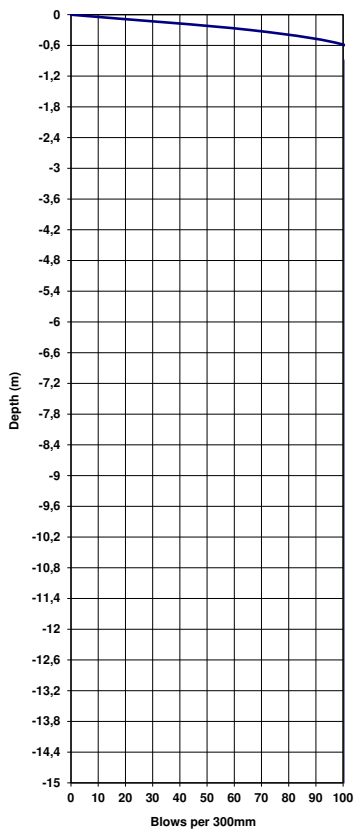
Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	56	Stiff
	Ref	

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0



Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	66	Stiff
	Ref	

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0



GONDWANA GEO SOLUTIONS

Consulting Geotechnical Engineers & Engineering Geologists

Cape Town Office:
13 Rocklands Road
Simonstown
CAPE TOWN
7975

Client: LYNERS CONSULTING ENGINEERS
Project: Upgrade of Bonnievale Water Treatment Works
Section:

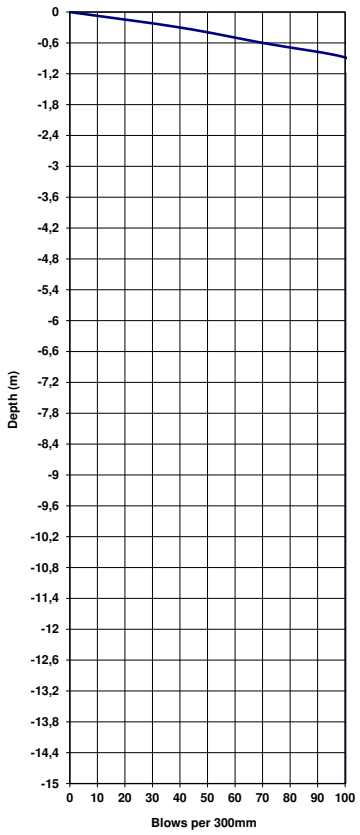
Ref.No. 25-130
Date: 08/12/2025
Operator: PT

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 4***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	40	Stiff
0,6	70	Very Stiff
	Ref	

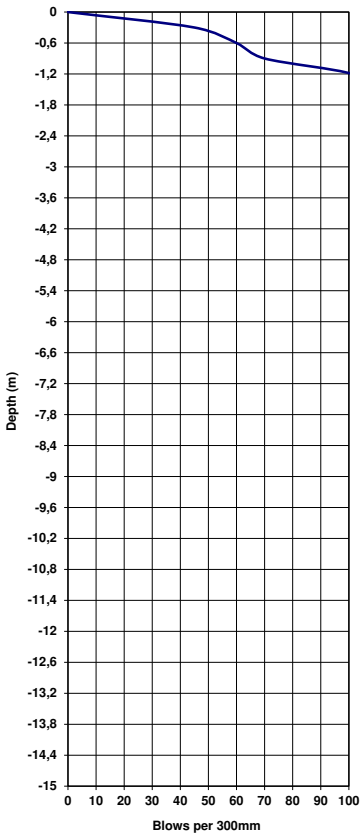


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 5***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	45	Stiff
0,6	60	Stiff
0,9	70	Very Stiff
	Ref	

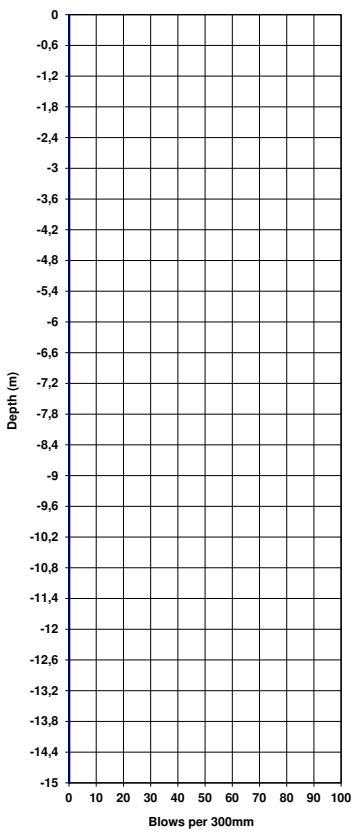


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		



THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

APPENDIX C

STEYN-WILSON LABORATORIES
CIVIL ENGINEERING TESTING LABORATORIES

sanas Testing Laboratory T0835

11 Gooderson Road Blackheath
PO Box 58 Blackheath 7581
Tel: 021 905 0435
Fax: 086 499 9482
Email: info@steynwilson.co.za
Web: www.steynwilson.co.za

Client:	**Gondwana Geo Solutions**
Project:	Bonnivale WTW
Attention:	Mark Richter
Your Ref. No:	25-130/1
Date Reported	Friday, 16 January 2026

TEST REPORT REFERENCE NUMBER / JOB NUMBER : SWL49722

Dear Sir / Madam

Herewith please find the original reports pertaining to the above mentioned project.

Test Requested

2 x MOD / CBR / FOUNDATION INDICATOR

Site Sampling and Materials Information

Sampling Method	*Specimens delivered to Steyn Wilson Laboratory.*
Environmental Condition	*Sunny & Windy*
Deviation from the prescribed test method	*No deviation from standard test method.*
Responsibility of information disclaimer	*The sample information was received from the customer. Results apply to the sample as received from the Customer.*

FINAL REPORT

We would like to take this opportunity to thank you for your valued support.
Should you have any further enquiries please don't hesitate to contact me.

Yours Faithfully
STEYN-WILSON LABORATORIES (PTY) LTD

Mr. J.Steyn
Technical Signatory

Remarks:

1. Information contained herein is confidential to STEYN-WILSON PTY LTD and the addressee
2. Opinions & Interpretations are not included in our schedule of Accreditation.
3. The samples where subjected and analysed according to ASTM.
4. The results reported relate only to the sample tested, Further use of the attached information is not the responsibility or liability of STEYN-WILSON LABORATORIES (PTY) LTD.
5. This document is the correct record of all measurements made, and may not be reproduced other than with full written approval from a director of STEYN-WILSON LABORATORIES (PTY) LTD.
6. Measuring equipment is traceable to national standards (Where applicable).
7. Should there be any deviation from the prescribed test method comments will be made thereof, pertaining to the test on the relevant materials report.
8. Uncertainty of measurement is calculated and corresponds to a coverage probability of approximately 95%. Available on request.
9. The decision rule states that the measurement of uncertainty can be applied by the customer to the test results, on request. It is not the responsibility or liability of STEYN-WILSON LABORATORIES (PTY) LTD.

DIRECTORS: **Mr. J. Steyn ND-Civil (Managing) | Mr. R. Wilson B-Tech Civil (Operations)**

STEYN-WILSON LABORATORIES
CIVIL ENGINEERING TESTING LABORATORIES

sanas Testing Laboratory T0835

11 Gooderson Road Blackheath
PO Box 58 Blackheath 7581
Tel: 021 905 0435
Fax: 086 499 9482
Email: info@steynwilson.co.za
Web: www.steynwilson.co.za

Customer :	**Gondwana Geo Solutions**	Project :	Bonnivale WTW
	13 Rocklands Road	Date Received :	08 December 2025
	Simonstown	Date Reported :	16 January 2026
	7975	Req. Number :	25-130/1
Attention :	Mark Richter		

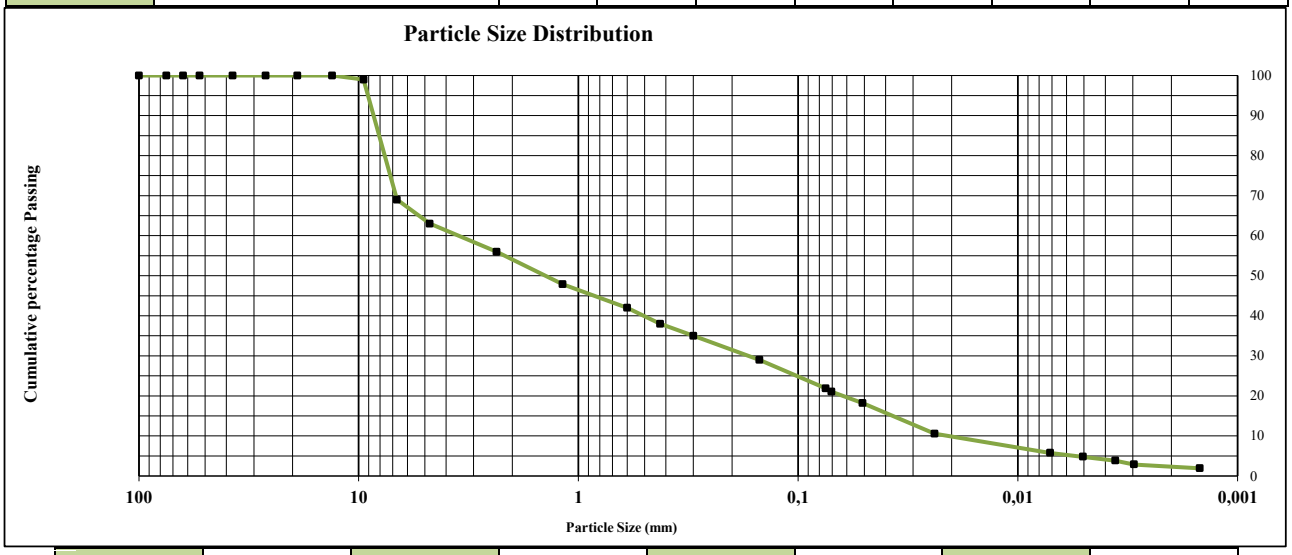
MOD / CBR / FOUNDATION INDICATOR - ASTM D422 / SANS 3001 GR10 / SANS 3001 GR12 / SANS 3001 GR30 / SANS 3001 GR40 / TMH1 A1* / TMH1 A12T*

Material Description:	Dry Brown Loose to Medium Dense intact Silty Fine to Coarse SAND with occasional Cobble, Gravel and Rubble.Fill	Sample Number:	49722 / 1		
Position:	TP1	Liquid Limit	**22,4**	Linear Shrinkage	**3,7**
Depth:	0.00 - 1.20m	Plasticity Index	**7,4**	Insitu M/C%	**1,4**

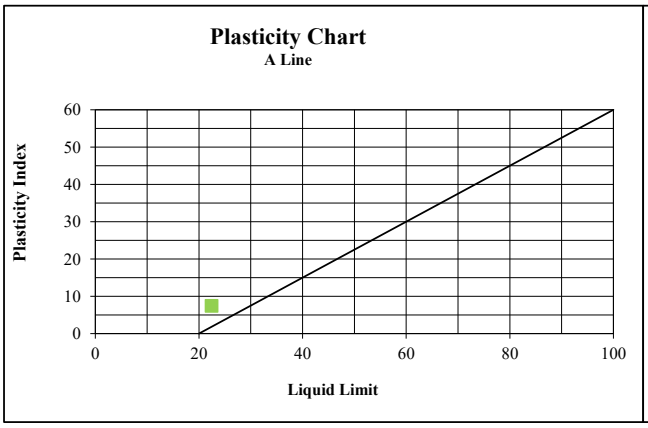
pH (TMH1 A20)		Conductivity (s/m) (TMH1 A21T)		SG (TMH1 A12T)*	2,482

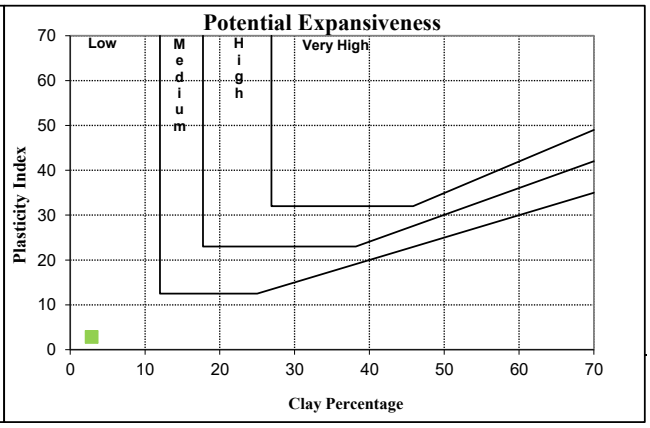
SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075	0,071	0,051	0,024	0,007	0,005	0,004	0,003	0,001
100	100	100	100	100	100	100	100	99	69	63	56	47,9	42	38	35	29	21,9	21,1	18,2	10,5	5,7	4,8	3,8	2,9	1,9
% Passing																									

MOD AASHTO SANS 3001 GR30		CBR SANS 3001 GR40							
OMC%	12,3	COMP MC	% SWELL	100%	98%	97%	95%	93%	90%
MDD(KG/M^3)	1955	7,4	2,09	10	8	7	6	4	3



% Gravel	37	% Sand	41	% Silt	19	% Clay	3





NOTE: All tests marked with (*) means that those test methods are not accredited.

STEYN-WILSON LABORATORIES
CIVIL ENGINEERING TESTING LABORATORIES

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Customer :	**Gondwana Geo Solutions**	Project :	Bonnivale WTW
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Attention :	Mark Richter		

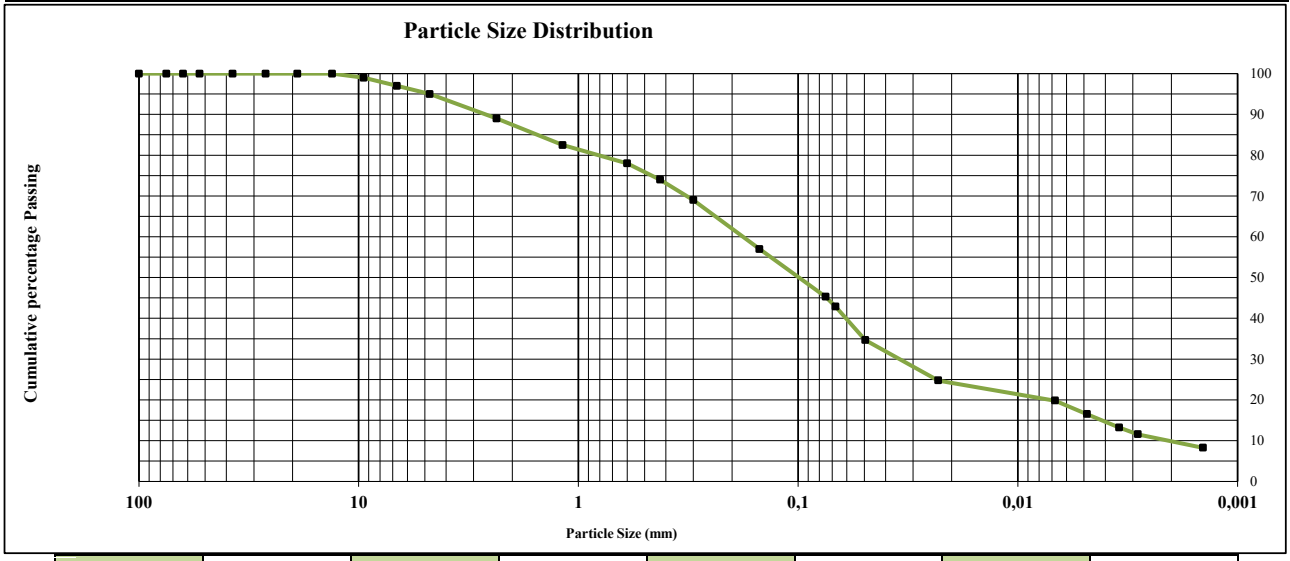
MOD / CBR / FOUNDATION INDICATOR - ASTM D422 / SANS 3001 GR10 / SANS 3001 GR12 / SANS 3001 GR30 / SANS 3001 GR40 / TMH1 A1* / TMH1 A12T*

Material Description:	Dry Brown Stiff vbecoming Very Stiff with depth intact Silty Sandy CLAY. Residual Siltstone	Sample Number:	49722 / 2			
Position:	TP4	Liquid Limit	**24,1**	Linear Shrinkage	**4,5**	
Depth:	1.10 - 3.00m	Plasticity Index	**9,1**	Insitu M/C%	**11,6**	

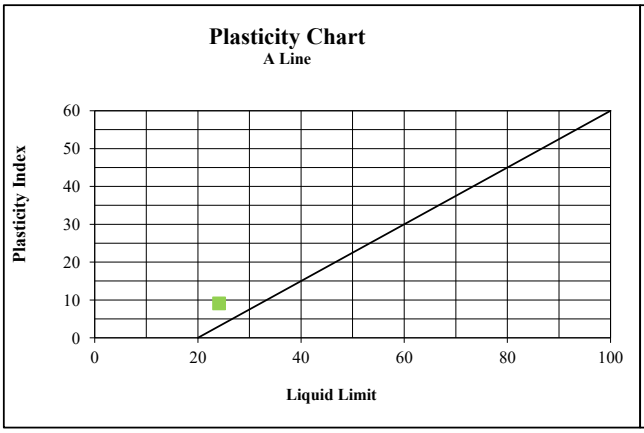
pH (TMH1 A20)		Conductivity (s/m) (TMH1 A21T)		SG (TMH1 A12T)*	2,532

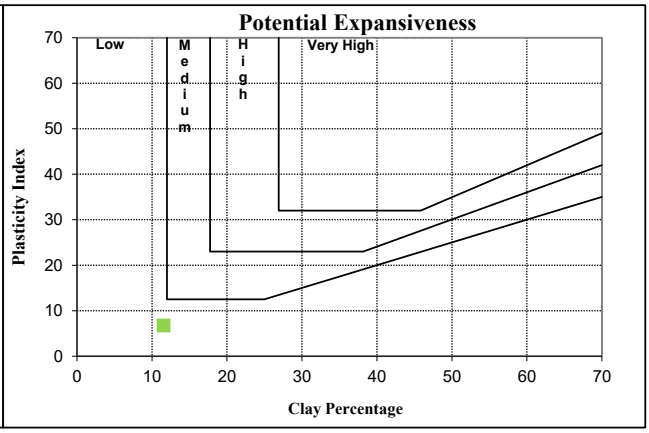
SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075	0,068	0,049	0,023	0,007	0,005	0,003	0,003	0,001
100	100	100	100	100	100	100	100	99	97	95	89	82,5	78	74	69	57	45,3	42,9	34,7	24,8	19,8	16,5	13,2	11,6	8,3
% Passing																									

MOD AASHTO SANS 3001 GR30		CBR SANS 3001 GR40						
OMC%	9,5	COMP MC	% SWELL	100%	98%	97%	95%	93%	90%
MDD(KG/M^3)	2128	9,4	2,17	11	9	8	7	5	4



% Gravel	5	% Sand	51	% Silt	33	% Clay	12

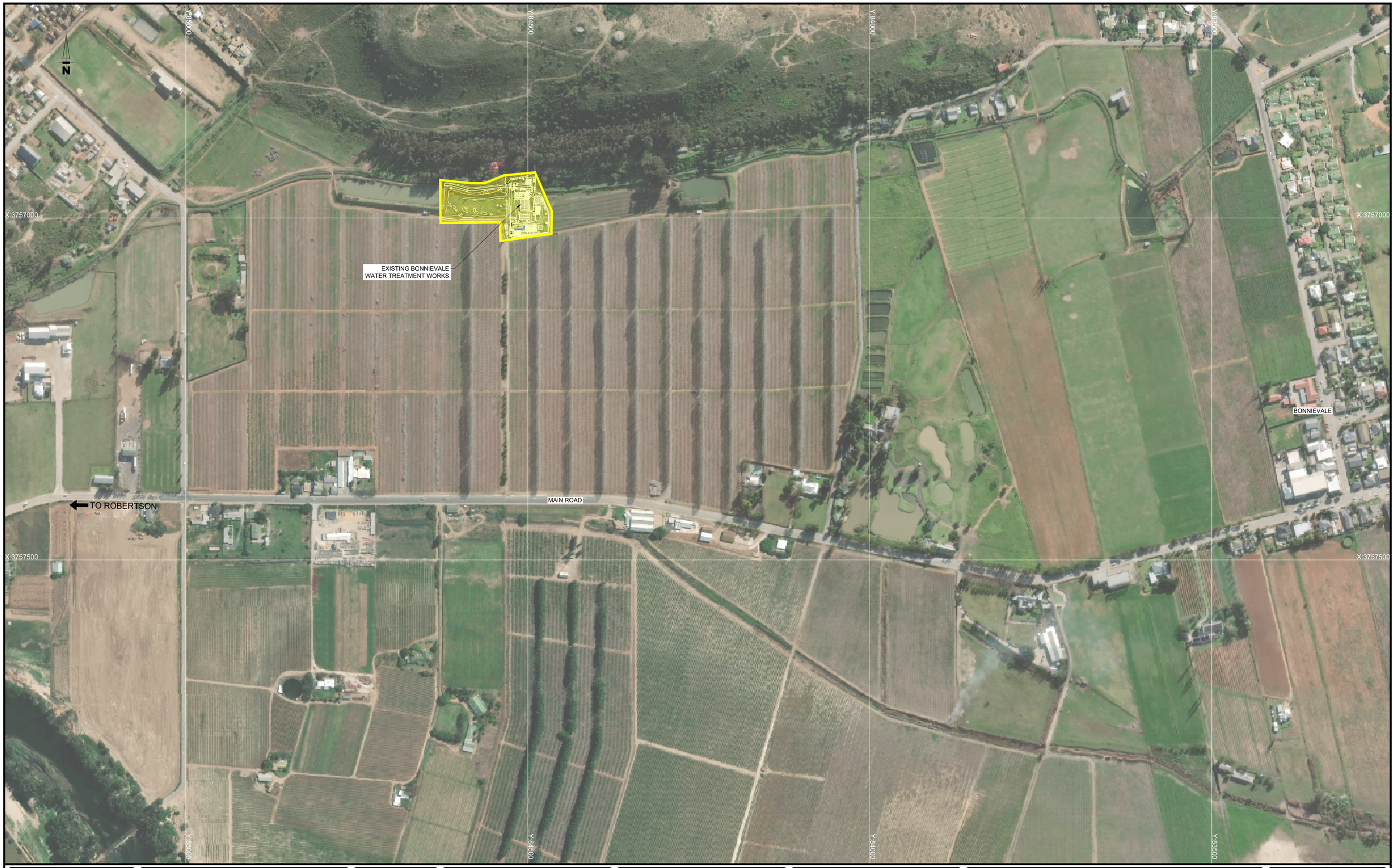




NOTE: All tests marked with (*) means that those test methods are not accredited.

ANNEXURE D:

DRAWINGS



SCALEBAR

0 75 150

Meters 1:2500

REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	'26-03-02	ES	ML

REVISIONS

DESIGNED	HB	2026/02
DRAWN	ES	2026/02
CHECKED	ML	2026/02

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The reference made to Engineer will also refer to Employer's Agent for GCC 2015 or GCC 2025 Contracts where applicable

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email: bellville@lyners.co.za

PAARL OFFICE:
PO Box 70, PAARL, 7646
Tel: 021 872 0622
email: paarl@lyners.co.za

GEORGE OFFICE:
PO Box 757, GEORGE, 6530
Tel: 044 887 0223
email: george@lyners.co.za

APPROVED

ENGINEERS: _____

DATE: 2026-03-02

APPROVED

CLIENT: _____

DATE: _____

CLIENT

LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT

UPGRADE OF BONNIEVALE WTW

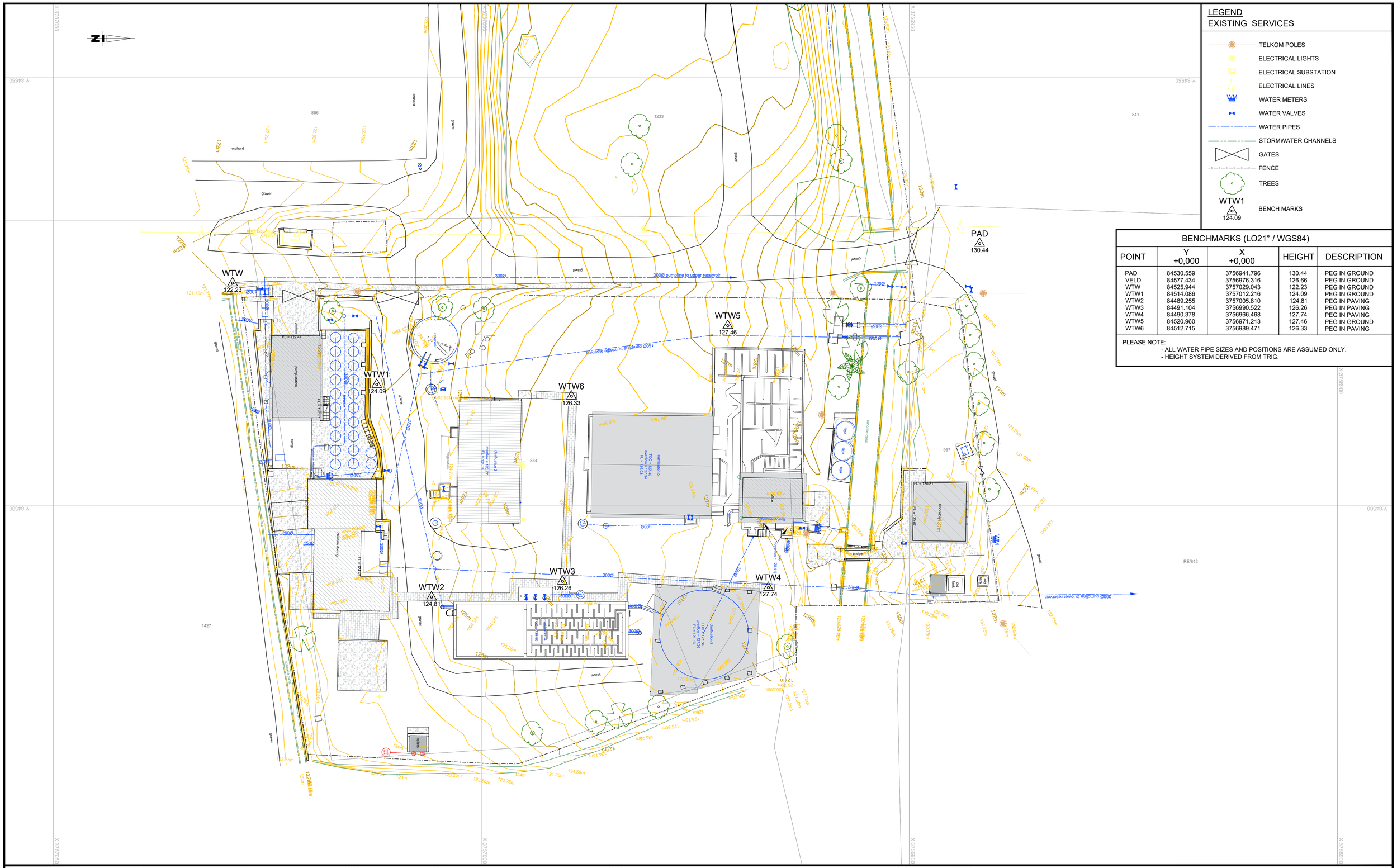
TITLE

LOCALITY PLAN

SCALE on A1	SHEET
1:2500	1 OF 1
CONTRACT No.	PROJECT No. 24203C

DRAWING No. 24203-C-000-01 REV A

COORDINATE SYSTEM: WGS84 / Lo 21°



LEGEND
EXISTING SERVICES

- TELKOM POLES
- ELECTRICAL LIGHTS
- ELECTRICAL SUBSTATION
- ELECTRICAL LINES
- WATER METERS
- WATER VALVES
- WATER PIPES
- STORMWATER CHANNELS
- GATES
- FENCE
- TREES
- BENCH MARKS (WTW1, 124.09)

BENCHMARKS (LO21° / WGS84)

POINT	Y +0,000	X +0,000	HEIGHT	DESCRIPTION
PAD	84530.559	3756941.796	130.44	PEG IN GROUND
VELD	84577.434	3756976.316	126.66	PEG IN GROUND
WTW	84525.944	3757029.043	122.23	PEG IN GROUND
WTW1	84514.086	3757012.216	124.09	PEG IN GROUND
WTW2	84489.255	3757005.810	124.81	PEG IN PAVING
WTW3	84491.104	3756990.522	126.26	PEG IN PAVING
WTW4	84490.378	3756966.468	127.74	PEG IN PAVING
WTW5	84520.960	3756971.213	127.46	PEG IN GROUND
WTW6	84512.715	3756989.471	126.33	PEG IN PAVING

PLEASE NOTE:
- ALL WATER PIPE SIZES AND POSITIONS ARE ASSUMED ONLY.
- HEIGHT SYSTEM DERIVED FROM TRIG.

SCALEBAR

0 6 12

Meters 1:200

REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	'26-03-02	ES	ML

REVISIONS

DESIGNED	HB	2026/02
DRAWN	ES	2026/02
CHECKED	ML	2026/02

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CONSULTING ENGINEERS

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Tel: 021 872 0622
email: paarl@lyners.co.za

GEORGE OFFICE:
PO Box 757, GEORGE, 6530
Tel: 044 887 0223
email: george@lyners.co.za

APPROVED

ENGINEERS: _____

DATE: 2026-03-02

APPROVED

CLIENT: _____

DATE: _____

CLIENT

LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT

UPGRADE OF BONNIEVALE WTW

TITLE

EXISTING SERVICES

SCALE	on A1	SHEET
1:200		1 OF 1
CONTRACT No.		PROJECT No. 24203C

DRAWING No. 24203-C-000-01 REV A

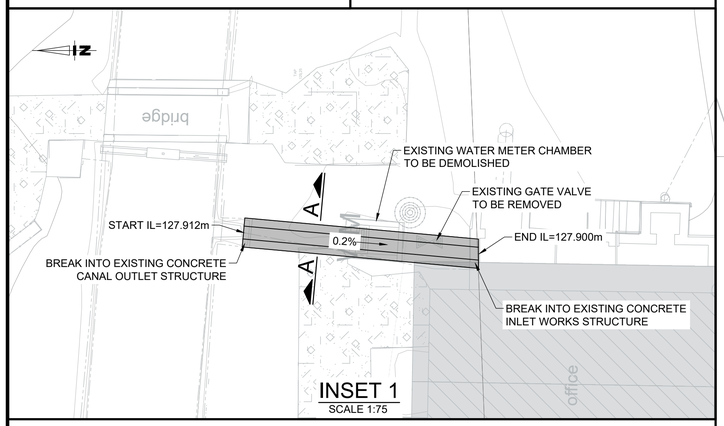
COORDINATE SYSTEM: WGS84 / Lo 21°

LEGEND
EXISTING SERVICES

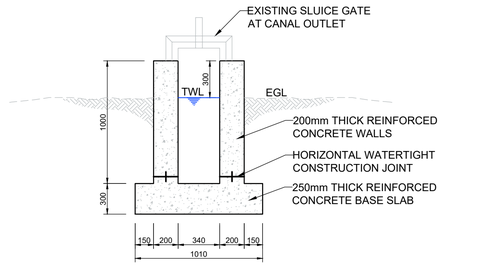
- TELKOM POLES
- ELECTRICAL LIGHTS
- MB — ELECTRICAL SUBSTATION
- ELECTRICAL LINES
- WM — WATER METERS
- WATER VALVES
- WATER PIPES
- STORMWATER CHANNELS
- GATES
- FENCE
- TREES
- WTW1 / 124.09 — BENCH MARKS

Notes:

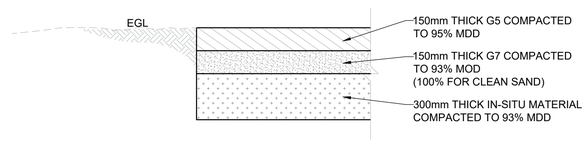
1. Contractor must verify location and extent of all the existing services prior to commencement of work. Any discrepancies must be liased with Engineer immediately.
2. The contractor must ensure the existing WTW remains operational during construction.
3. Refer to mechanical drawings for detail of proposed mechanical equipment.



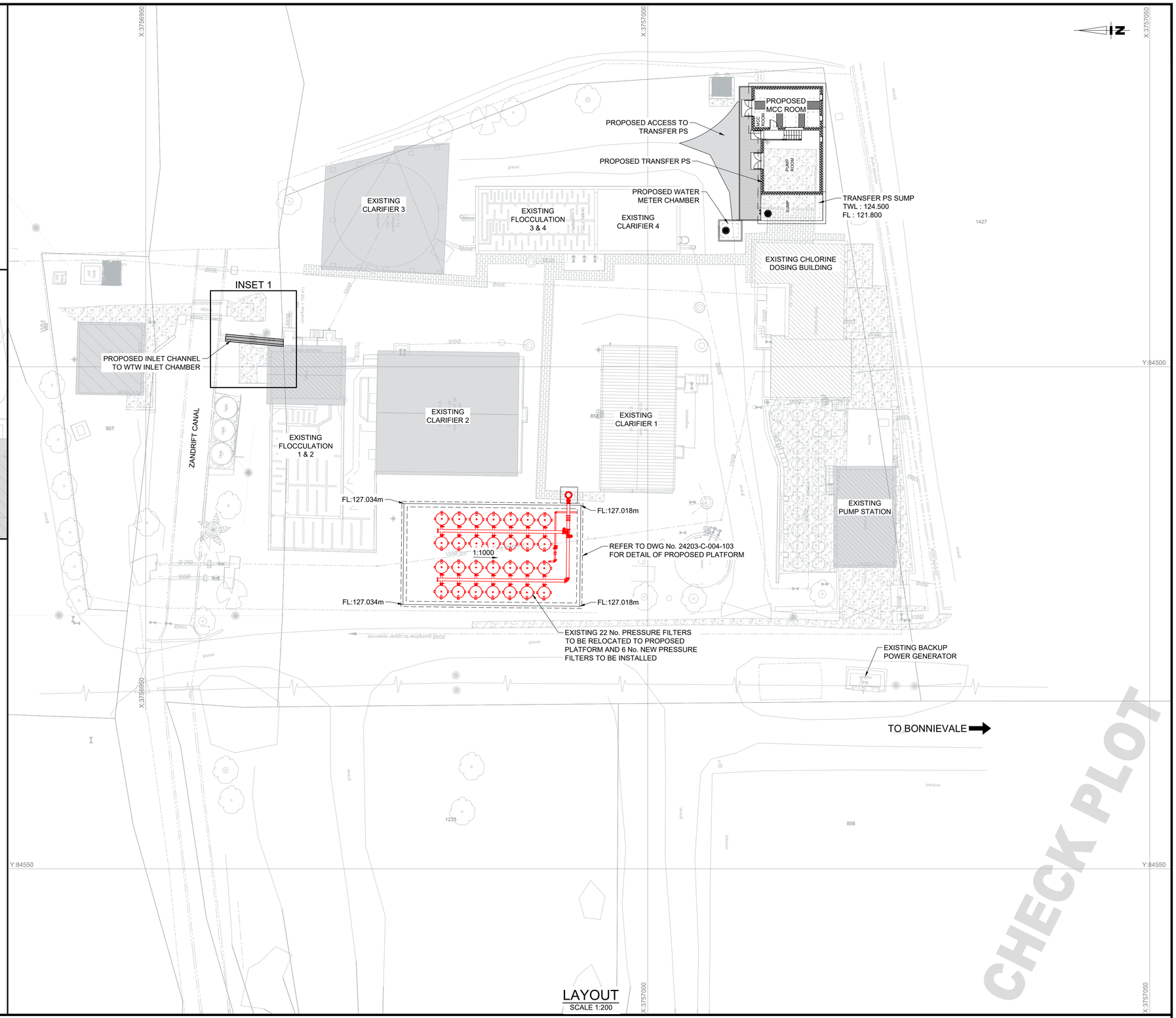
INSET 1
SCALE 1:75



SECTION A-A
SCALE 1:25



DETAIL OF TRANSFER PUMP STATION ACCESS ROAD LAYERWORKS
N.T.S.



LAYOUT
SCALE 1:200

CHECK PLOT

SCALEBAR
0 6 12
Meters 1:200

REV	DESCRIPTION	DATE	REV BY	CHKD
B	AMENDMENTS FOR TENDER	'26-03-10	ES	ML
A	ISSUED FOR TENDER	'26-03-02	ES	ML

REVISIONS

DESIGNED	HB	2026/02
DRAWN	ES	2026/02
CHECKED	ML	2026/02

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All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer.

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 or GCC 2025 Contracts where applicable

CONSULTING ENGINEERS
LYNERS
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Tel: 021 872 0622
email: paarl@lyners.co.za
GEORGE OFFICE:
PO Box 757, GEORGE, 6530
Tel: 044 887 0223
email: george@lyners.co.za

APPROVED
ENGINEERS: _____
DATE: 2026-03-10

APPROVED
CLIENT: _____
DATE: _____

CLIENT
LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT
UPGRADE OF BONNIEVALE WTW

TITLE
GENERAL ARRANGEMENT

SCALE on A1	SHEET
1:200	1 OF 1
CONTRACT No.	PROJECT No. 24203C

DRAWING No. 24203-C-004-01 REV B

COORDINATE SYSTEM: WGS84 / Lo 21°

Date: 2026-03-10
Checked:
Auditing: Erene Swanepoel

Notes:

1. Contractor must verify location and extent of all the existing services prior to commencement of work. Any discrepancies must be liaised with the Engineer immediately.
2. All pipes must be installed with a minimum cover of 1000mm unless otherwise stated.

LEGEND
EXISTING SERVICES

- TELKOM POLES
- ELECTRICAL LIGHTS
- ELECTRICAL SUBSTATION
- ELECTRICAL LINES
- WATER METERS
- WATER VALVES
- WATER PIPES
- STORMWATER CHANNELS
- GATES
- FENCE
- TREES
- BENCH MARKS (e.g. WTW1, 124.09)
- ADDITIONAL PIPE WORK
- ADDITIONAL PIPES FLOW DIRECTION

LEGEND
PROPOSED SERVICES

- 160mmØ HDPE PE100 PN6 WATER PIPE
- 300mmØ HDPE PE100 PN6 WATER PIPE
- 550mmØ HDPE PE100 PN6 WATER PIPE
- 50mmØ HDPE PE100 PN6 PRESSURE RELIEF PIPELINE
- ISOLATING VALVE
- FLOW DIRECTION
- CONNECTION ARROW

EXISTING WATER CLOSET
PROPOSED MCC ROOM
PROPOSED TRANSFER PUMP STATION
EXISTING CLARIFIER 3
EXISTING FLOCCULATION 3 & 4
EXISTING CLARIFIER 4
EXISTING CHLORINE DOSING BUILDING
PROPOSED INLET CHANNEL TO WTW INLET CHAMBER
CONNECTION TO EXISTING COMMON FEED PIPE FROM CLARIFIERS 3 & 4
TEMPORARY CONNECTION TO EXISTING FILTERS DURING FILTERS RELOCATION
EXISTING PRESSURE FILTERS TO BE RELOCATED TO PROPOSED PLATFORM
EXISTING SUMP
CONNECT TO EXISTING CHLORINE DOSING PS FEED PIPELINE
EXISTING CLARIFIER 2
EXISTING CLARIFIER 1
EXISTING FLOCCULATION 1 & 2
ZANDRIFT CANAL
CONNECTION TO EXISTING COMMON FEED PIPE FROM CLARIFIERS 1 & 2
EXISTING FILTERS RELOCATED TO PROPOSED PLATFORM
EXISTING PUMP STATION
PROPOSED PRESSURE RELIEF PIPELINE
(NC)
PROPOSED BACKWASH RECOVERY PIPELINE TO EXISTING BACKWASH SYSTEM (NORMALLY CLOSED)
EXISTING RISING MAIN TO BE REROUTED
TEMPORARY CONNECTION TO EXISTING FILTERS DURING FILTERS RELOCATION
TO BONNIEVALE
PROPOSED BACKWASH RECOVERY PIPELINE
X:3756950
X:3757000
X:3757050
Y:84500
Y:84550
RE/842
841
957
1233
856
1427

CHECK PLOT

SCALEBAR
0 6 12
Meters 1:200

REV	DESCRIPTION	DATE	REV BY	CHKD
B	PIPEWORK AMENDED	'26-03-10	ES	ML
A	ISSUED FOR TENDER	'26-03-02	ES	ML

REVISIONS

DESIGNED	HB	2026/02
DRAWN	ES	2026/02
CHECKED	ML	2026/02

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APPROVED
ENGINEERS:
DATE: 2026-03-10

APPROVED
CLIENT:
DATE:

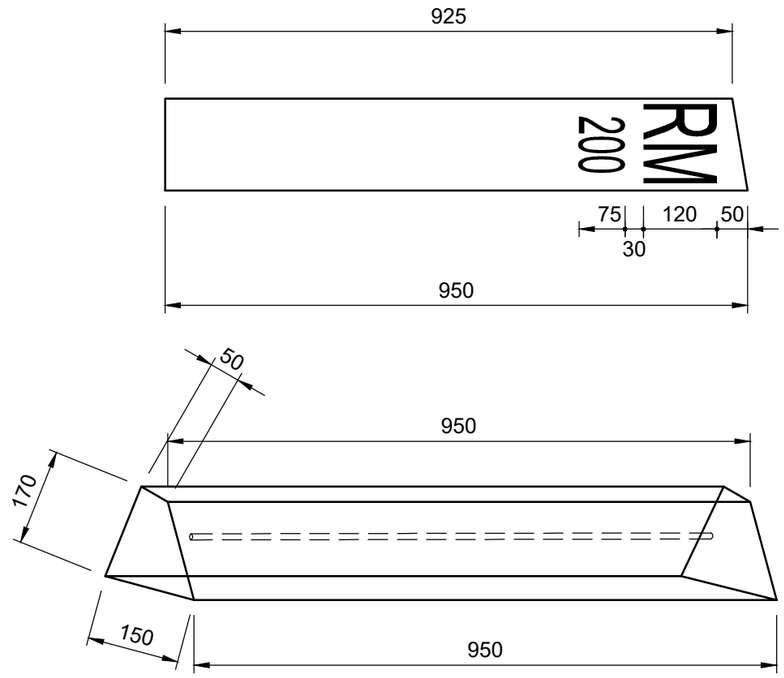
CLIENT
LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

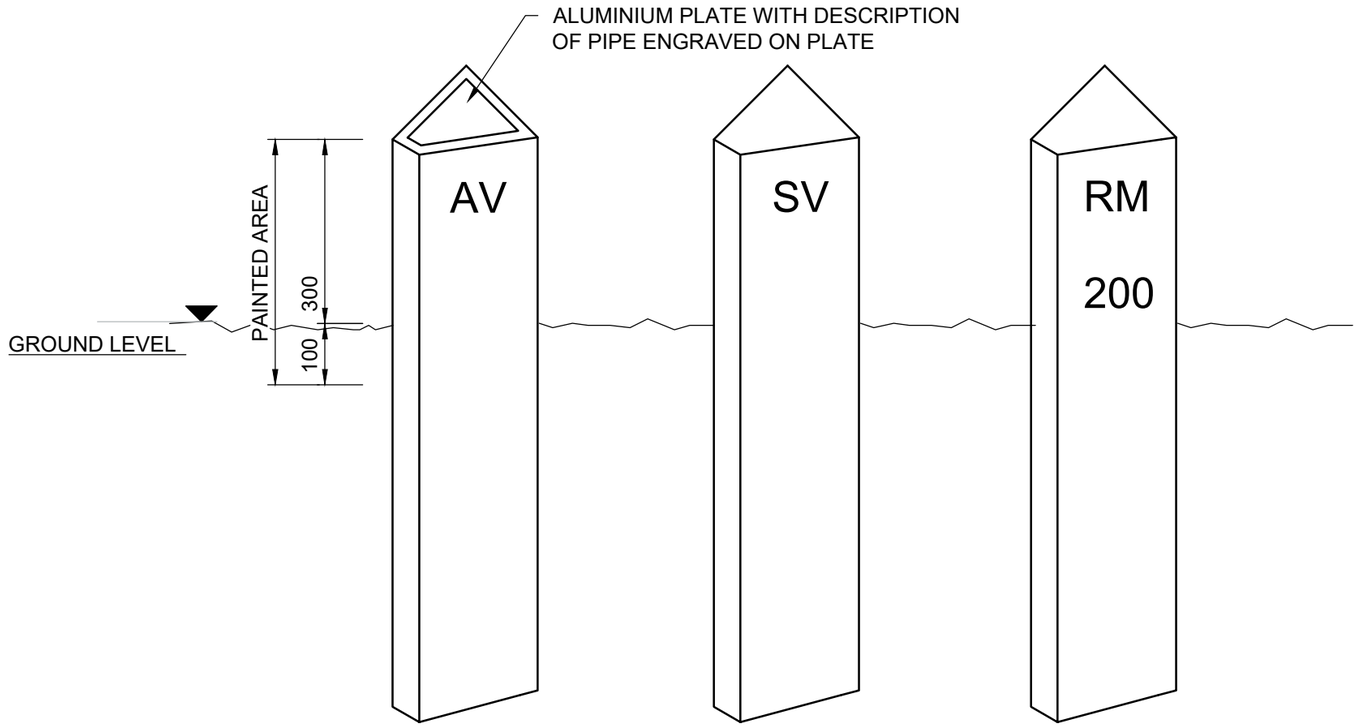
PROJECT
UPGRADE OF BONNIEVALE WTW

TITLE
PIPEWORK LAYOUT

SCALE on A1: 1:200	SHEET: 1 OF 1
CONTRACT No.	PROJECT No.: 24203C
DRAWING No.: 24203-C-004-02	REV: B
COORDINATE SYSTEM: WGS84 / Lo 21°	

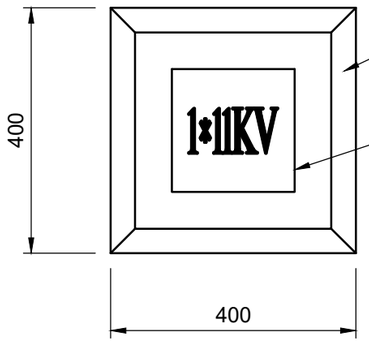
Date: 2026-03-10
Checked:
Auditing: Erenne Swanepoel

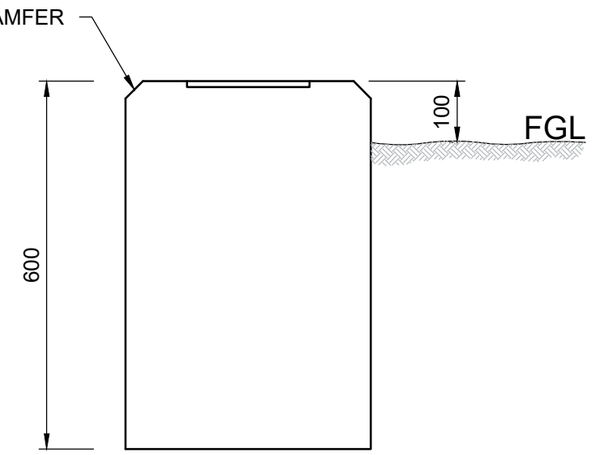




NOTES :

1 SECTION ABOVE GROUND MUST BE 300mm
2 REINFORCE MARKER WITH 1xY10 BAR IN CENTER (875mm LONG)
3 NON REFLECTORIZED PAINT SHALL BE USED ACCORDING TO SABS 731
COLOUR SPECIFICATIONS :
MARKER - WHITE (TO BE PAINTED UP TO 100mm
BELOW NATURAL GROUNDLEVEL)
LETTERING - GOLDEN YELLOW
4 PIPE ROUTE MARKERS EVERY 100m AND CHANGE IN DIRECTION
5 PIPE ROUTE MARKERS SHALL INDICATE DIAMETER OF PIPES
6 V = VALVE AND SIZE
W = WATERMAIN AND DIAMETER SIZE
AV = AIR VALVE
SV = SCOUR VALVE
RM = RISING MAIN





REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	'26-03-11	ES	ML

REVISIONS

DESIGNED	HB	
DRAWN	ES	
CHECKED	ML	

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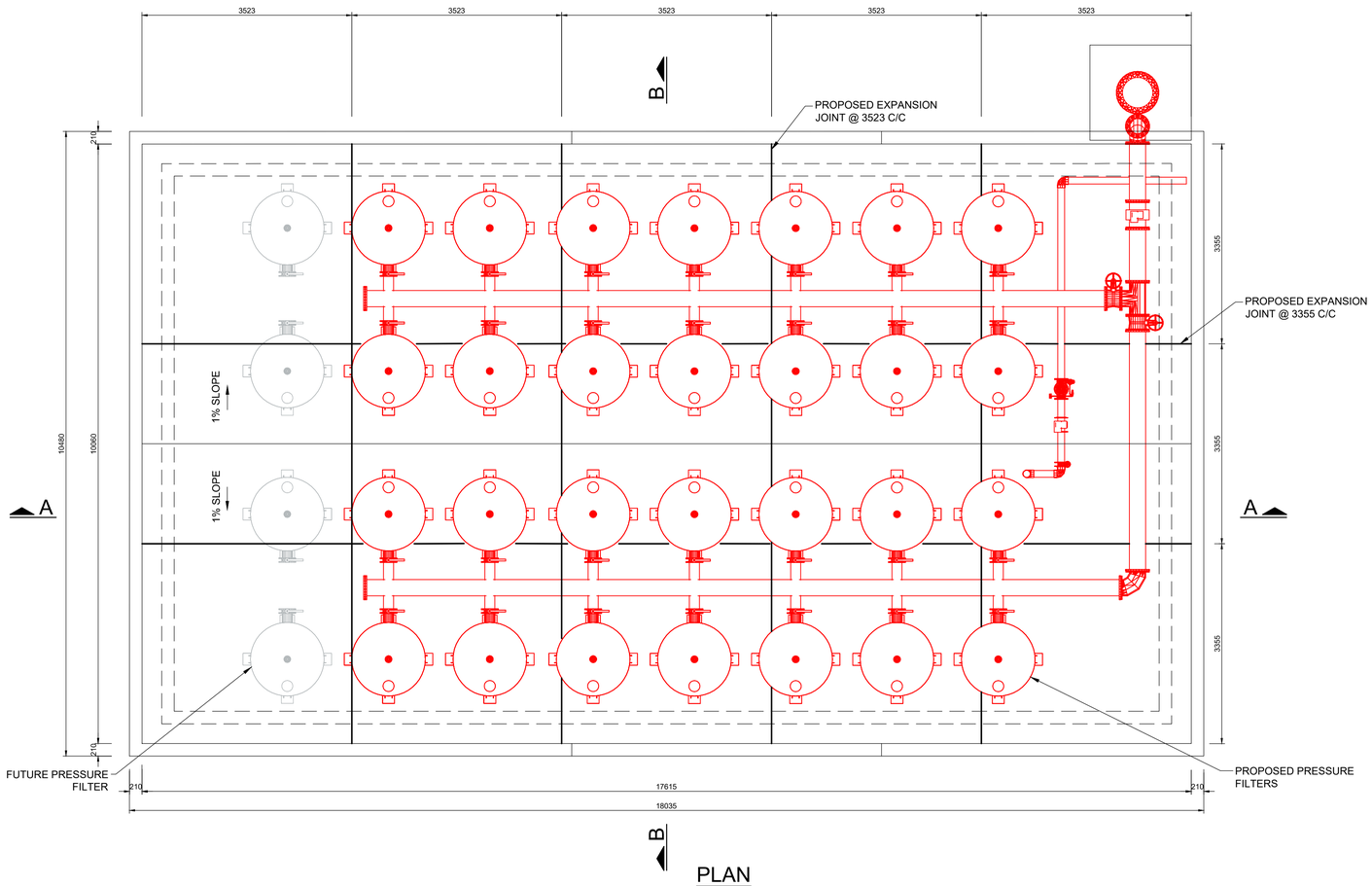
PROJECT
UPGRADING OF BONNIEVALE WATER TREATMENT WORKS

TITLE
TYPICAL DETAIL OF SERVICES ROUTE MARKER

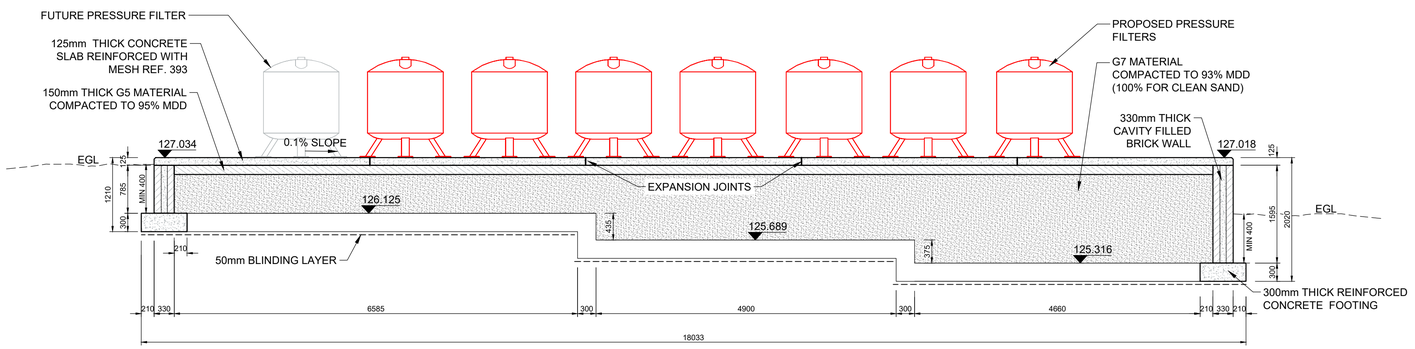
SCALE 1:10 on A3	SHEET 1 OF 1
CONTRACT No.	PROJECT No. 24203C

DRAWING No. 24203-C-004-101 REV A

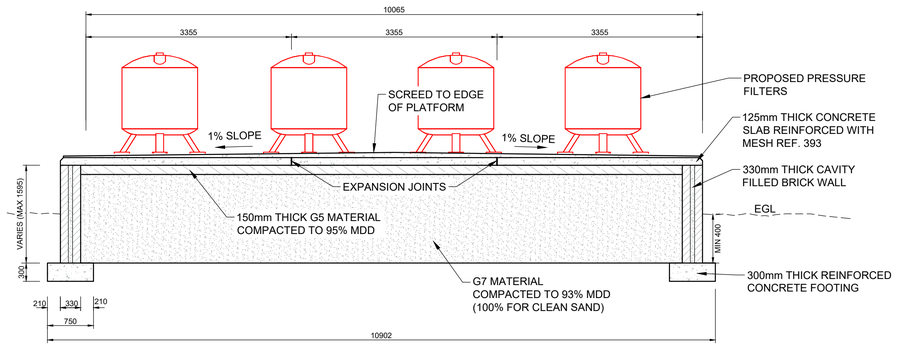
COORDINATE SYSTEM: N/A



PLAN
SCALE 1:50



SECTION A-A
SCALE 1:50



SECTION B-B
SCALE 1:50

SCALEBAR

0 1.5 3
Meters 1:50

REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	'26-03-11	ES	ML

REVISIONS

DESIGNED	HB	2026/02
DRAWN	ES	2026/02
CHECKED	ML	2026/02

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APPROVED

ENGINEERS: _____

DATE: 2026-03-11

APPROVED

CLIENT: _____

DATE: _____

CLIENT

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT

UPGRADE OF BONNIEVALE WTW

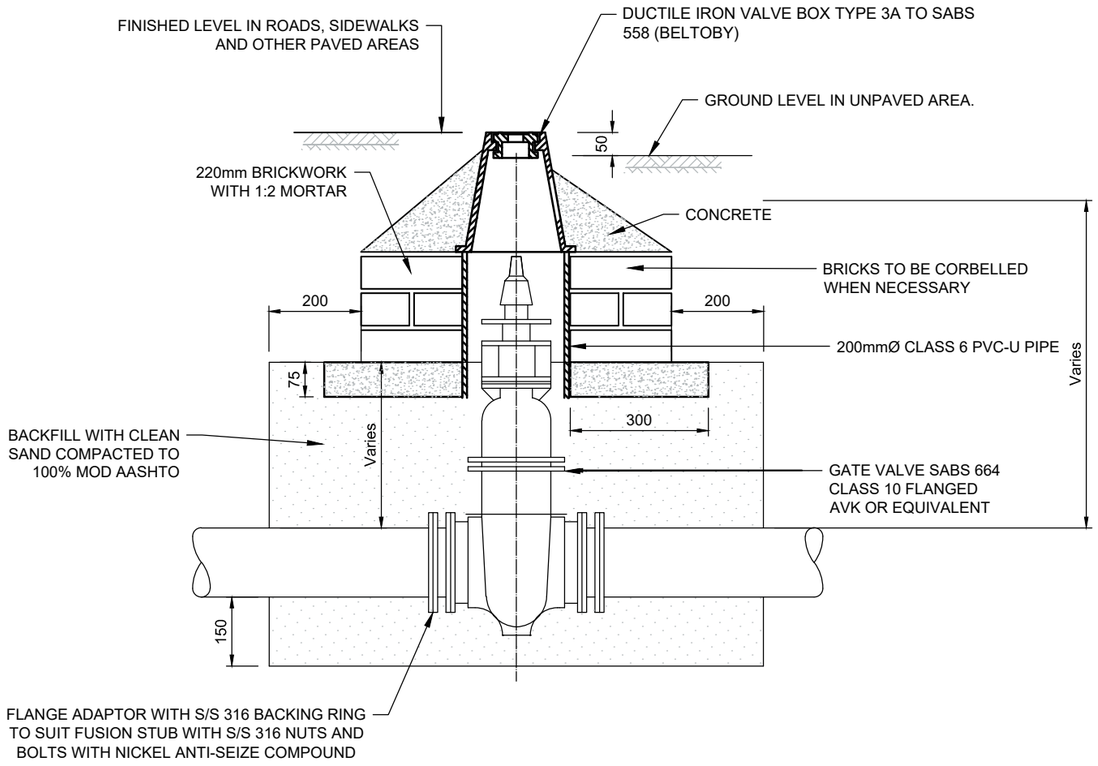
TITLE

DETAIL OF PRESSURE FILTER PLATFORM

SCALE on A1	SHEET
1:200	1 OF 1
CONTRACT No.	PROJECT No. 24203C

DRAWING No. 24203-C-004-103 REV A

COORDINATE SYSTEM: WGS84 / Lo 21°



DETAIL OF VALVE CHAMBER
(PIPES UP TO 200mmØ)

NOTES:

1. ALL VALVES MUST HAVE A SQUARE SPINDLE CAP WITH S/S 316 NUTS AND BOLTS AND MUST BE ANTI-CLOCKWISE CLOSING.
2. ALL CONCRETE TO BE CLASS 20/19
3. INSTALL S/S EXTENSION ROD ON VALVE SPINDEL IF THE TOP OF THE VALVE IS MORE THAN 400mm BELOW FINISHED SURFACE LEVEL
4. USE TWO COATS OIL PAINT FOR COVERS
5. ALL CONCRETE TO BE 25MPa/19mm

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR TENDER	'26-03-11	ES	ML

REVISIONS

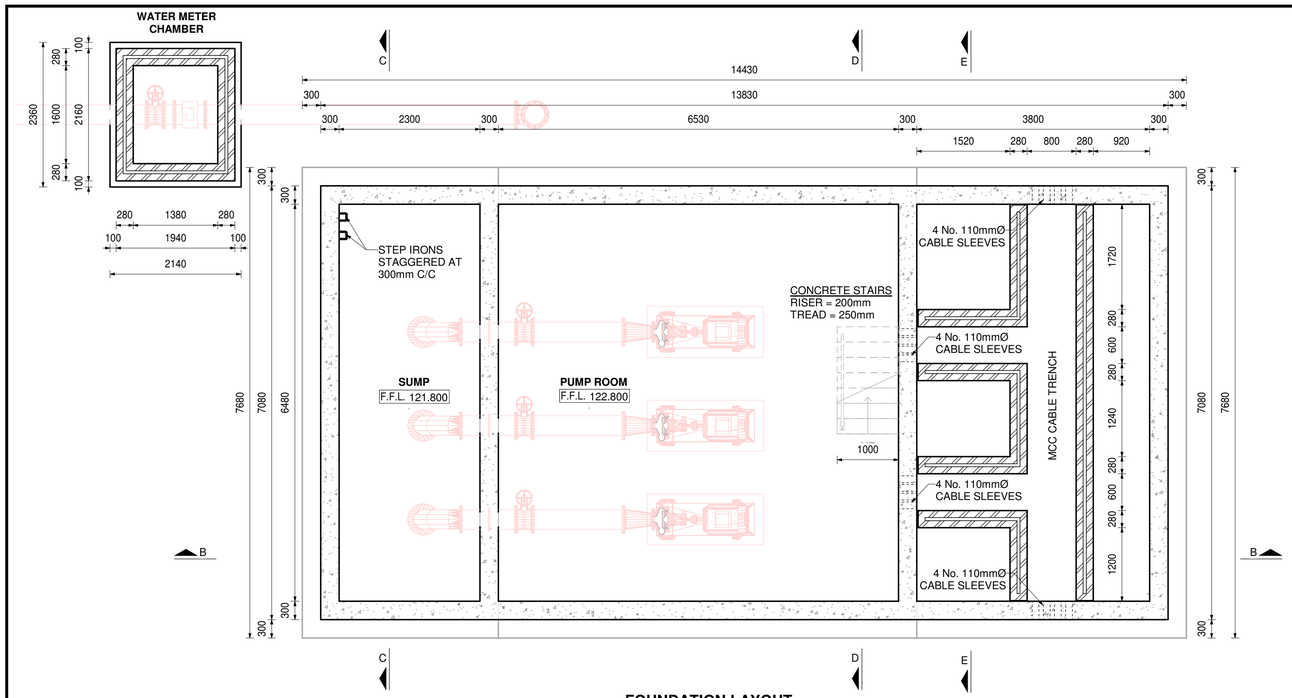
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DRAWN	ES	
CHECKED	ML	

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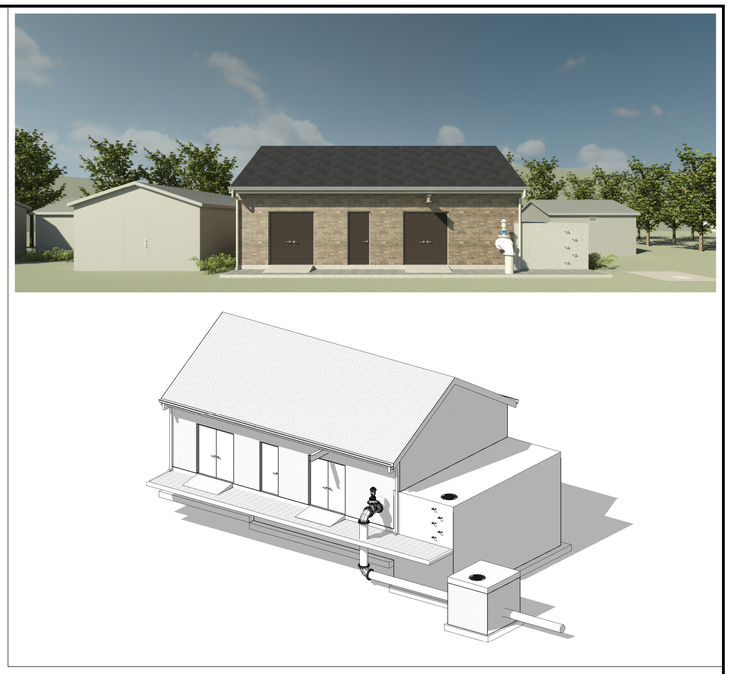
PROJECT
UPGRADING OF BONNIEVALE WATER TREATMENT WORKS

TITLE
TYPICAL DETAIL OF VALVE

SCALE on A3: NTS	SHEET: 1 OF 1
CONTRACT No.	PROJECT No.: 24203C
DRAWING No.: 24203-C-004-104	REV: A
COORDINATE SYSTEM: N/A	

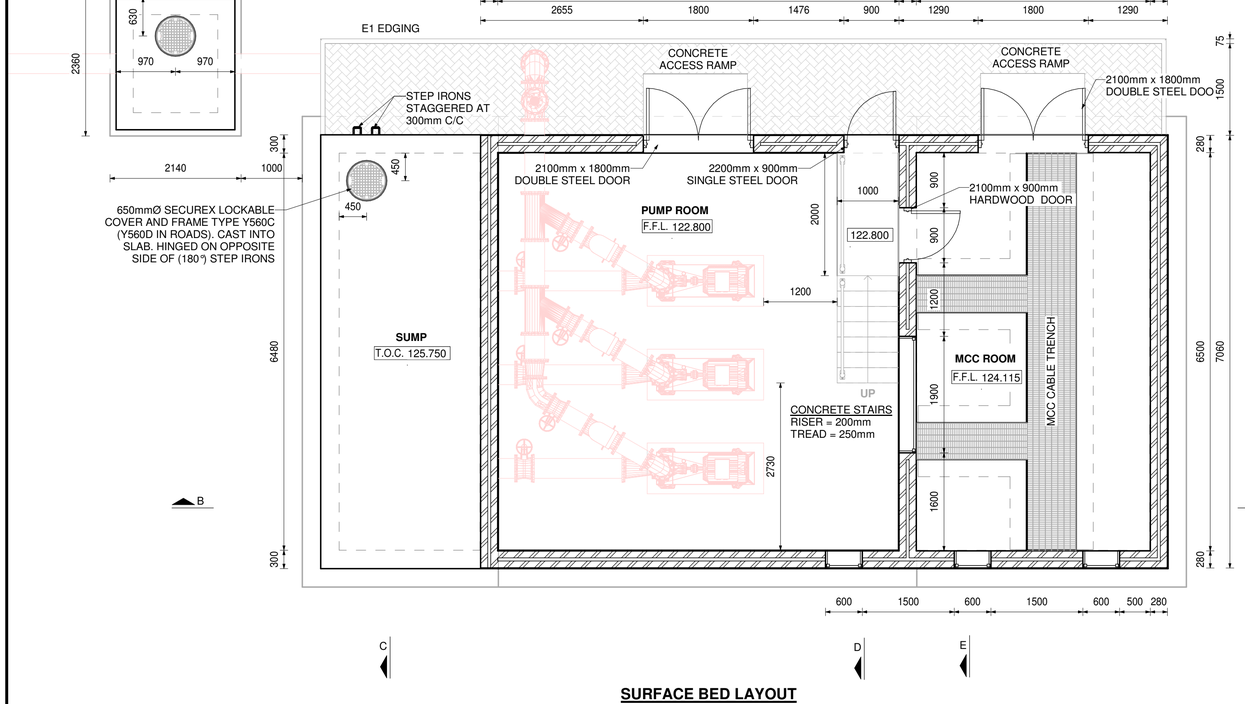


FOUNDATION LAYOUT
SCALE 1 : 50

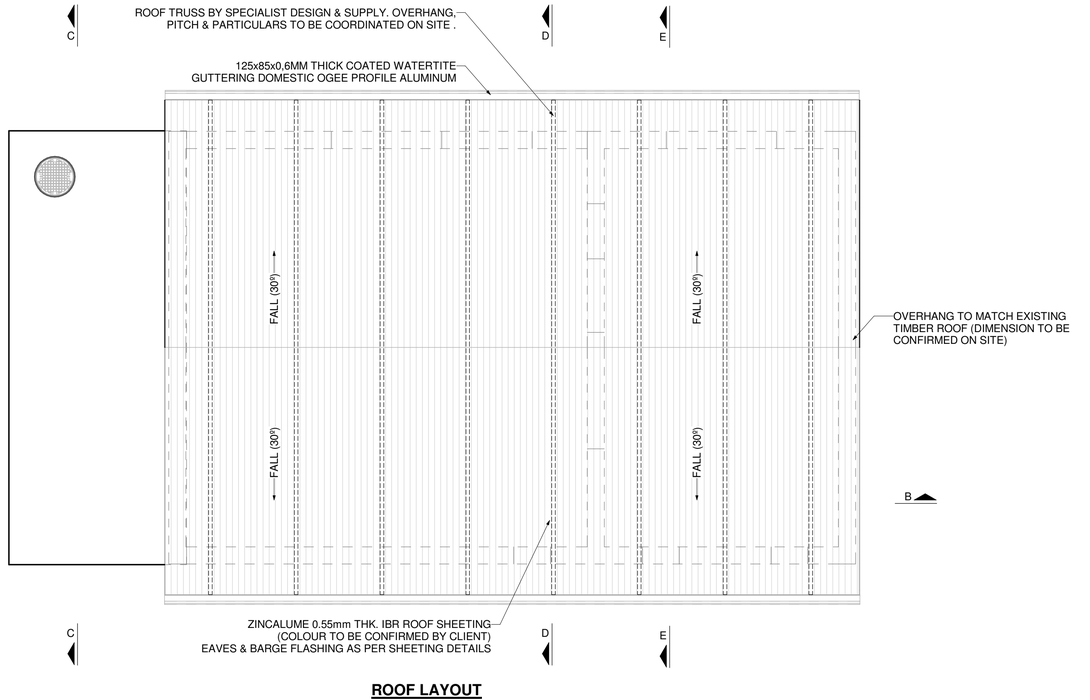


NOTES:

1. ROOF TRUSS BY SPECIALIST DESIGN & SUPPLY. OVERHANG, PITCH & PARTICULARS TO BE COORDINATED ON SITE
2. 125x85x0,6MM THICK COATED WATERTITE GUTTERING DOMESTIC OGEE PROFILE ALUMINUM
3. OVERHANG TO MATCH EXISTING TIMBER ROOF DIMENSION TO BE CONFIRMED ON SITE)
4. ZINCALUME 0.55mm THK. IBR ROOF SHEETING COLOR TO BE CONFIRMED BY CLIENT) EAVES & BARGE FLASHING AS PER SHEETING DETAILS



SURFACE BED LAYOUT
SCALE 1 : 50



ROOF LAYOUT
SCALE 1 : 50

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SCALE BAR
AS SHOWN

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REV	DESCRIPTION	DATE	REV BY	CHKD
B	BUILDING SIZE AMENDED	2026-03-11	RW	ML
A	ISSUED FOR TENDER	2026-02-27	RW	ML

REVISIONS

DESIGNED	HB	
DRAWN	RW	
CHECKED	ML	

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ENGINEERS:
DATE: 2026-03-11

APPROVED:
CLIENT:
DATE:

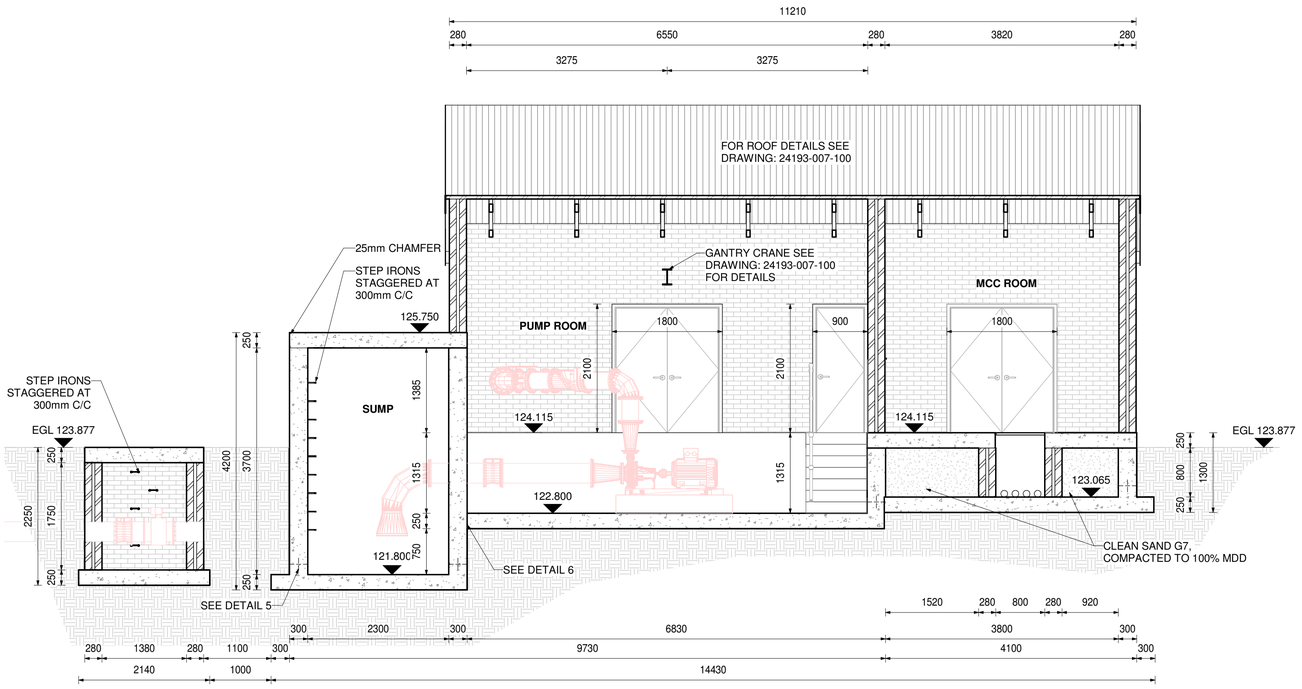
CLIENT:
LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME
UPGRADING OF BONNIEVALE WTW

TITLE
DETAIL OF TRANSFER PUMP STATION - LAYOUTS

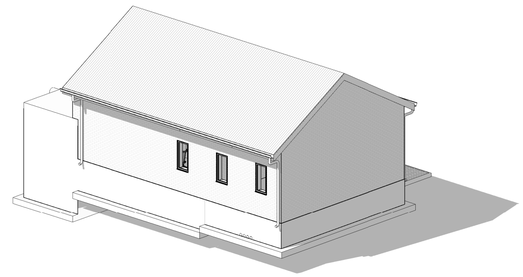
SCALE ON A1	SHEET
AS SHOWN	2 OF 3
CONTRACT NO	PROJECT NO
	C24203

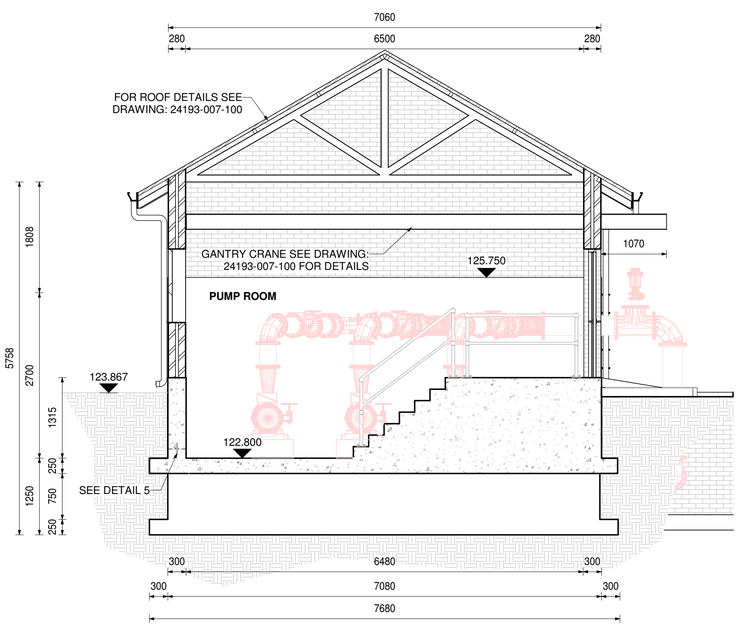
DRAWING NO: 24203-C-007-100 REV B
COORDINATE SYSTEM: N/A



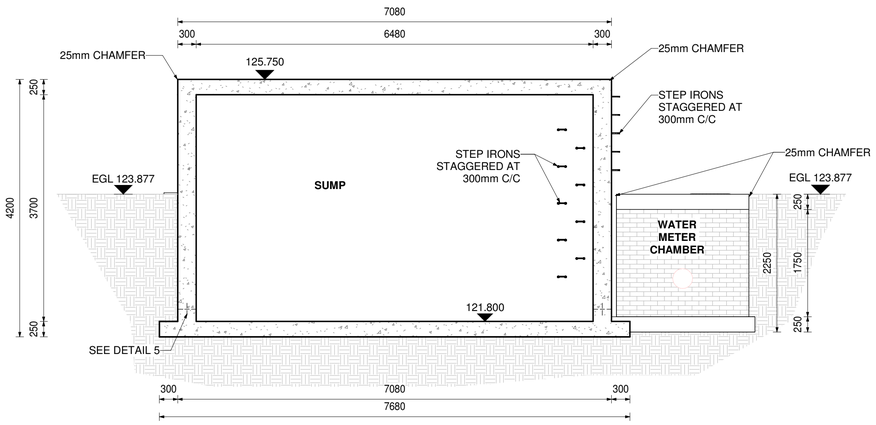
SECTION B-B
SCALE 1 : 50



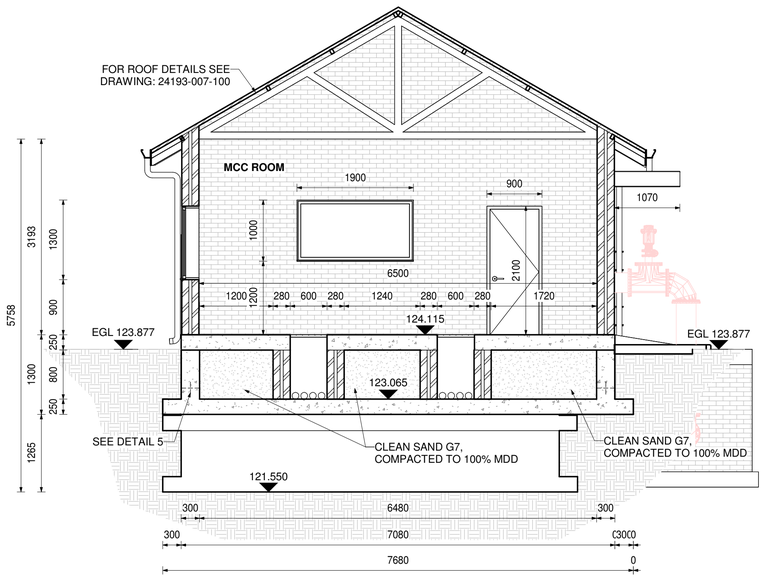




SECTION D-D
SCALE 1 : 50



SECTION C-C
SCALE 1 : 50



SECTION E-E
SCALE 1 : 50

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SCALE BAR

AS SHOWN

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REV	DESCRIPTION	DATE	REV BY	CHKD
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A	ISSUED FOR TENDER	2026-02-27	RW	ML

REVISIONS

DESIGNED	HB
DRAWN	RW
CHECKED	ML

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APPROVED:

CLIENT:

DATE:

CLIENT:

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PROJECT NAME

UPGRADING OF BONNIEVALE WTW

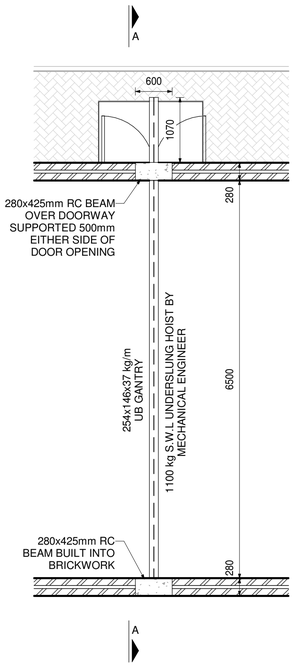
TITLE

DETAIL OF TRANSFER PUMP STATION - SECTIONS

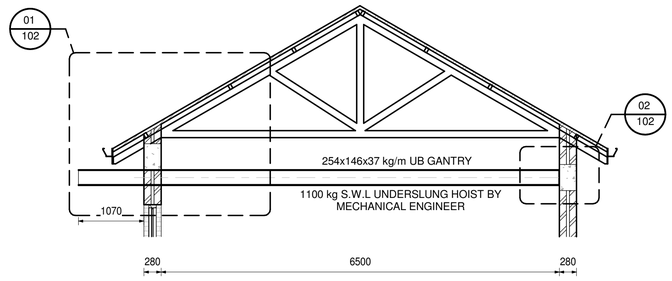
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AS SHOWN	2 OF 2
CONTRACT NO	PROJECT NO
	C24203

DRAWING NO: 24203-C-007-101 REV B

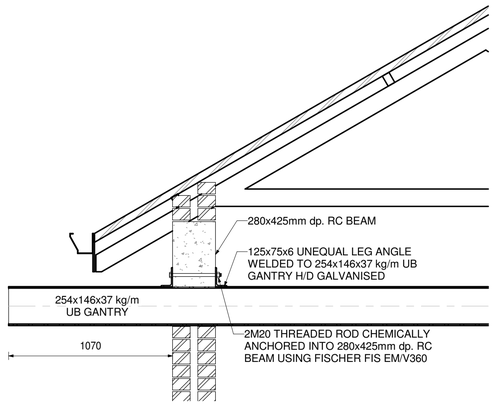
COORDINATE SYSTEM: WGS84/Lo19°



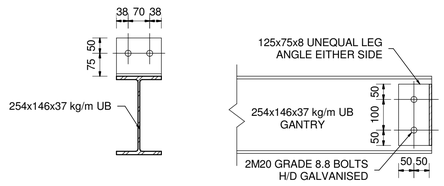
GANTRY CRANE LAYOUT
SCALE 1 : 50



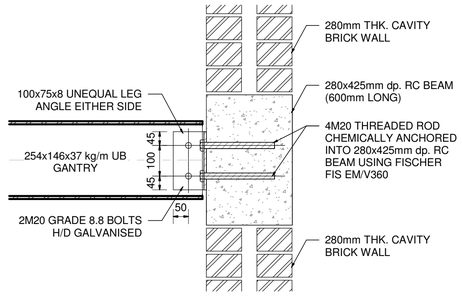
SECTION A-A OF GANTRY CRANE
SCALE 1 : 50



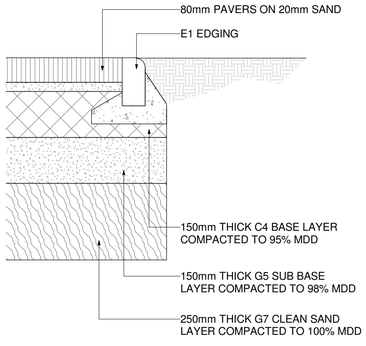
DETAIL 1 - GANTRY UPPER BEAM CONNECTION
SCALE 1 : 20



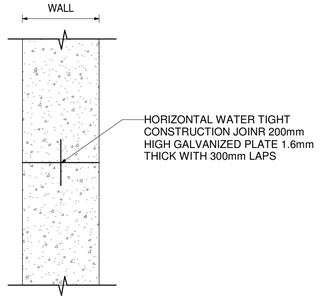
DETAIL 3 - GANTRY DETAIL
SCALE 1 : 10



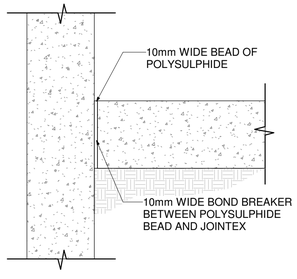
DETAIL 2 - GANTRY CRANE BEAM CONNECTION
SCALE 1 : 10



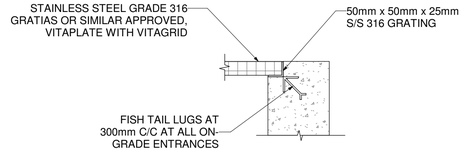
DETAIL 4 - PAVIING DETAIL
SCALE 1 : 10



DETAIL 5 - WATER JOINT DETAIL
SCALE 1 : 10



DETAIL 6 - JOINT DETAILS
SCALE 1 : 10



DETAIL 7 - GRID DETAIL
SCALE 1 : 10

CONSTRUCTION NOTES

1. GENERAL

A. DRAWINGS TO BE READ IN CONJUCTION WITH ALL RELEVANT ARCHITECTURAL DRAWINGS & SPECIFICATIONS. ANY DESCREPANCIES TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
B. ALL PIPE PENETRATIONS TO BE COORDINATED WITH MECHANICAL ENGINEERS DRAWINGS & SPECIFICATIONS. ANY DISCREPANCIES TO BE REPORTRED TO THE ENGINEER IMMEDIATELY.

2. SPECIFICATIONS

ALL LATEST EDITIONS:
-SANS 2001 (ALL PARTS)
-SANS 10400 (ALL PARTS)

3. EARTHWORKS

A. ALL EXCAVATIONS & FOUNDATIONS MUST BE INSPECTED & APPROVED BY THE ENGINEER.
B. A 50mm THICK 15MPa MASS CONCRETE BLINDING SHALL BE CAST BELOW ALL REINFORCED FOUNDATIONS. NO BLINDING IS NECESSARY UNDER MASS CONCRETE STRIPFOOTINGS.
C. OMPACTION OF FILL MATERIAL AS SPECIFIED ON DRAWINGS.

4. FOUNDATIONS

A. EXCAVATE TO SPECIFIED FOUNDING LEVELS. IF UNSUITABLE BEARING MATERIAL IS FOUND AT THESE LEVELS, EXCAVATE DEEPER & BACKFILL WITH MASS CONCRETE.
B. MAX. ALLOWABLE BEARING PRESSURE = 150kPa AT APPROX. 1.2m DEPTH FROM N.G.L.

5. CONCRETE

A. CONCRETE CUBE CRUSHING STRENGTH AT 28 DAYS AS FOLLOW:

STRIP FOOTINGS	- 20MPa / 19mm
CONCRETE CAVITY FILL	- 25MPa / 9mm
SURFACE BED / APRON	- 30MPa / 19mm
COLUMNS	- 30MPa / 19mm
BEAMS & SLABS	- 30MPa / 19mm

B. ALL REINFORCED CONCRETE TO BE MECHANICALLY COMPACTED / VIBRATED.

6. REINFORCEMENT

A. ALL REINFORCEMENT TO BE INSPECTED & APPROVED BY THE ENGINEER BEFORE CASTING OF ANY CONCRETE. THE ENGINEER SHALL BE NOTIFIED NOT LESS THAN 24h PRIOR TO CONCRETE BEING POURED.
B. MINIMUM COVER TO REINFORCEMENT TO BE MAINTAINED BY CONCRETE BLOCK WITH WIRE TIES OR PVC SPACERS AS FOLLOW:

BASES	(ALL SIDES)	- 50mm
COLUMNS	(TO STIRRUPS)	- 40mm
BEAMS	(TO STIRRUPS)	- 40mm
SLABS	(TOP & BOTTOM)	- 40mm

C. CORRECT COVER TO ALL FIXED REINFORCEMENT WILL STRICTLY BE MONITORED BY THE ENGINEER & WILL BE IMMEDIATELY BE CONDEMNED IF NOT AS SPECIFIED.

7. LOADBEARING BRICKWORK

A. PROVIDE 2 LAYERS OF DPC ON TOP OF ALL LOADBEARING BRICKWORK ON CONTACT SURFACE BETWEEN BRICKS & WET CONCRETE. ANY CAVITIES TO BE CLOSED OFF WITH GALV. STEEL PLATE CAVITY CLOSURES.
B. MINIMUM STRUCTURAL REQUIREMENTS ACCORDING TO SANS 10164:

MORTAR	- CLASS II
MASONRY UNITS	- 14 MPa
CONCRETE BLOCKS	- 3.5 MPa

C. APPROVED BUTTERFLY WALL TIES TO BE USED AT THE FOLLOWING MAXIMUM SPACING IN CAVITY WALLS:

HORIZONTAL	-750mm
VERTICAL	-340mm

8. STRUCTURAL STEELWORK

A. ALL STRUCTURAL STEEL TO BE GRADE S355JR, INCLUDING PLATES.
B. ALL STEELWORK TO BE HOT DIP GALVANIZED TO SANS 121 AND COATED WITH:
- 1 X COAT ETCHING PRIMER;
- 1 X COAT EPOXY TOP PAINT TO CLIENT COLOUR PREFERENCE.

C. THE CONTRACTOR MUST CONFIRM ALL DIMENSIONS ON SITE, ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER IMMEDIATELY.
D. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.
E. WORKSHOP DRAWINGS MUST BE APPROVED BY LYNERS BEFORE MANUFACTURING ANY OF THE STRUCTURAL STEEL ELEMENTS. ANY CHANGES TO THE ENGINEER'S DRAWINGS MUST BE INDICATED TO & APPROVED BY THE ENGINEER.
F. ALL WELDED CONNECTIONS MUST BE WELDED ALL AROUND WITH A 6mm FILLET WELD EXCEPT WHERE SHOWN OTHERWISE.
G. WELDING MUST BE IN ACCORDANCE WITH SANS 10044 STANDARDS.
H. ALL BOLTS TO BE GRADE 8.8 EXCEPT WHERE SHOWN OTHERWISE. HOLDING-DOWN BOLTS TO BE COMMERCIAL GRADE THREADED BAR. ALL FASTENERS SHALL BE HOT DIP GALVANIZED.

9. MISCELLANEOUS ITEMS

A. WHERE APPLICABLE, ALL CHEMICAL ANCHORS TO BE INSTALLED STRICTLY IN ACCORDANCE WITH SUPPLIER'S INSTRUCTIONS & GOOD PRACTICE GUIDELINES.
B. SUPPLIERS OF PRECAST SLABS SHALL PROVIDE THE ENGINEER WITH A SANS 10400 FORM 3.

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALE BAR
AS SHOWN

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REV	DESCRIPTION	DATE	REV BY	CHKD
B	BUILDING SIZE AMEDED	2026-03-11	RW	ML
A	ISSUED FOR TENDER	2026-02-27	RW	ML

REVISIONS

DESIGNED	HB	
DRAWN	RW	
CHECKED	CD	

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APPROVED:
ENGINEERS:
DATE: 2026-03-11

APPROVED:
CLIENT:
DATE:

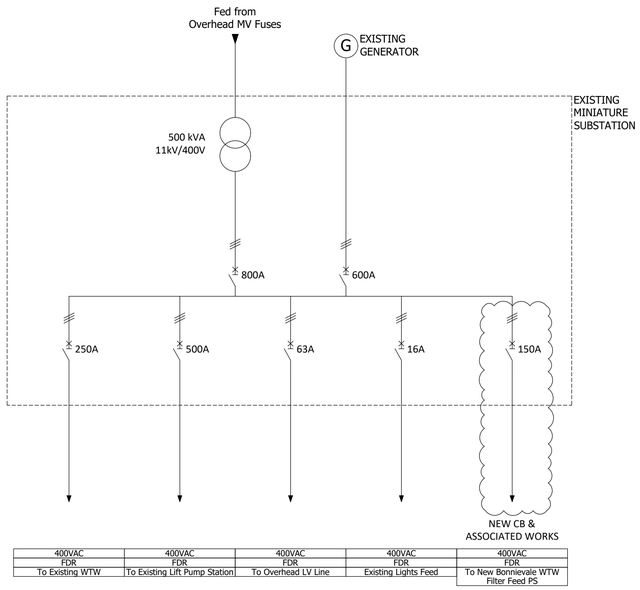
CLIENT:
LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME
UPGRADING OF BONNIEVALE WTW

TITLE
DETAIL OF TRANSFER PUMP STATION - DETAILS

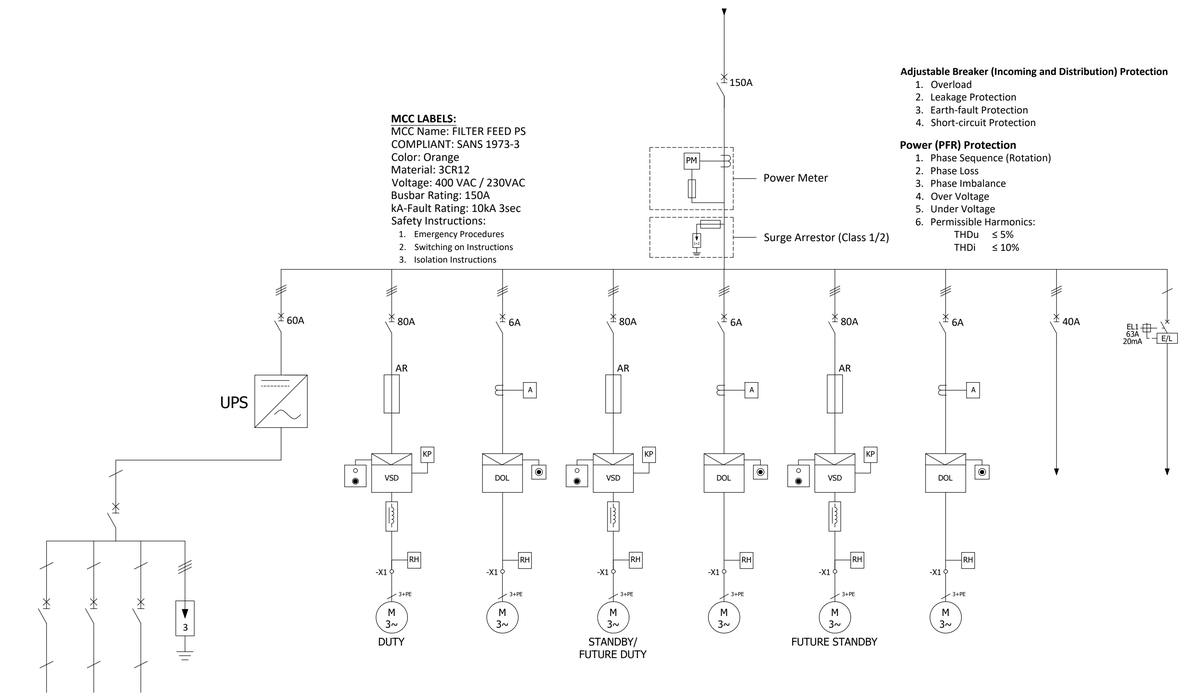
SCALE ON A1	SHEET
AS SHOWN	1 OF 3
CONTRACT NO	PROJECT NO
	C24203

DRAWING NO: 24203-C-007-102 REV B
COORDINATE SYSTEM: WGS84/Lo19°



400VAC	400VAC	400VAC	400VAC	400VAC
FDR	FDR	FDR	FDR	FDR
To Existing WTW	To Existing Lift Pump Station	To Overhead LV Line	Existing Lights Feed	To New Bonnievale WTW Filter Feed PS

MCC LABELS:
MCC Name: FILTER FEED PS
COMPLIANT: SANS 1973-3
Color: Orange
Material: 3CR12
Voltage: 400 VAC / 230VAC
Busbar Rating: 150A
kA-Fault Rating: 10kA 3sec
Safety Instructions:
1. Emergency Procedures
2. Switching on Instructions
3. Isolation Instructions

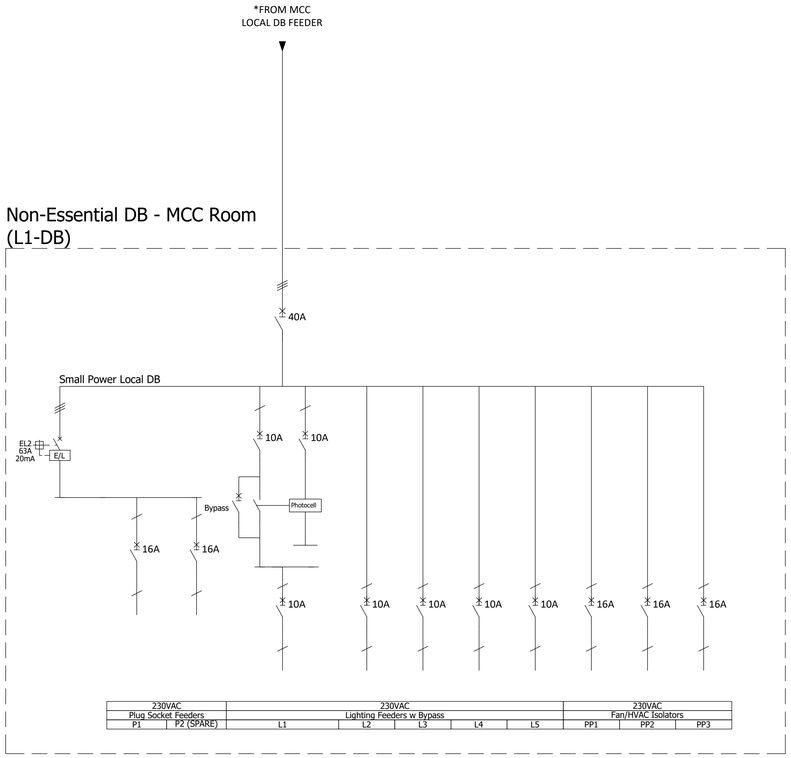


PLC, HMI & Instrumentation Feed	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	400VAC	230VAC
24VDC	UPS	30 kW	0.75 kW	30 kW	0.75 kW	30 kW	0.75 kW	FDR	FDR
		VSD	DOL	VSD	DOL	VSD	DOL	Feeder to Filter Feed PS MCC Room Local DB	Feeder to Earth Leakage for MCC-mounted plug-socket
		Pump 1	Pump 1 Cooling Fan	Pump 2	Pump 2 Cooling Fan	Pump 3	Pump 3 Cooling Fan		

Adjustable Breaker (Incoming and Distribution) Protection
1. Overload
2. Leakage Protection
3. Earth-fault Protection
4. Short-circuit Protection

Power (PFR) Protection
1. Phase Sequence (Rotation)
2. Phase Loss
3. Phase Imbalance
4. Over Voltage
5. Under Voltage
6. Permissible Harmonics:
   THDu ≤ 5%
   THDi ≤ 10%

*CONTINUED
ALONGSIDE



230VAC		230VAC					230VAC		
Plug Socket Feeders		Lighting Feeders w Bypass					Fan/HVAC Isolators		
P1	P2 (SPARE)	L1	L2	L3	L4	L5	PP1	PP2	PP3

LEGEND:

- Air Circuit Breaker
- Circuit Breaker
- Air Circuit Breaker Bus-coupler
- Bus-coupler
- Isolator
- Mechanical Interlock
- Electrical Interlock
- Key Type Interlock System
- 3p Fuse
- AR Ultra Rapid Semiconductor Fuse
- Phase Indication
- Smart Power Meter
- CT & Ammeter
- Running Hour Meter
- Combined Class 1&2 Surge Arrestor
- Surge Arrestor Class 3
- Power Factor Correction Unit
- Active Harmonic Filter
- Power Transformer
- Control Transformer
- Inline UPS
- Motor Starter:
  DOL: Direct on Line
  FW/REV: Forward Reverse
  SS: Soft Starter
  VSD: Variable Speed Drive
- 3p Contactor
- 3p Contactor Forward / Reverse
- Thermal Overload
- Door Mount Keypad/HMI
- Output Choke (dV/dT)
- 3P Motor
- 3P Motor w Torque Limiter
- 3P Earth Leakage Unit
- Actuator Valve
- Photocell w Contactor
- Emergency Stop
- Local Control Station
- 3P Motor w Heater
- Motorized Mechanically and Electrically Interlocked Changeover Mechanism
- Miniature Substation
- Supply Kiosk
- Emergency Backup Generator
- Cable Joint

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALEBAR
0 30 60
Meters 1:1000

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REV	DESCRIPTION	DATE	REV BY	CHKD
B	ISSUED FOR TENDER	'26-03-10	ABS	ABS
A	ISSUED FOR TENDER	'26-02-27	ABS	ABS

REVISIONS

DESIGNED	ABS	
DRAWN	JDC	
CHECKED	CD	

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APPROVED
ENGINEERS: _____
DATE: 2026-03-10

APPROVED
CLIENT: _____
DATE: _____

CLIENT
LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT
UPGRADE OF BONNIEVALE WTW

TITLE
ELECTRICAL SINGLE-LINE DIAGRAM

SCALE	SHEET
on A1 N.T.S.	1 OF 1
CONTRACT No.	PROJECT No. 24203C

DRAWING No. 24203-E-001-01 REV B
COORDINATE SYSTEM: WGS84 / Lo?°

Auditing: Jarred Carolissen Checked: Date: 2026-02-27

NEW FILTER FEED PS
MCC ROOM

MCC

NEW UNDERGROUND LV
RETICULATION FROM
EXISTING MINISUB
TO NEW FILTER FEED PS
MCC - BY HAND

NEW 3xØ160 SLEEVES
FOR LV ROAD
CROSSING

EXISTING MINIATURE
SUBSTATION

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0 30 60
Meters 1:1000

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REVISIONS

DESIGNED	ABS	
DRAWN	JDC	
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APPROVED
ENGINEERS: _____
DATE: 2026-03-10

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CLIENT: _____
DATE: _____

CLIENT
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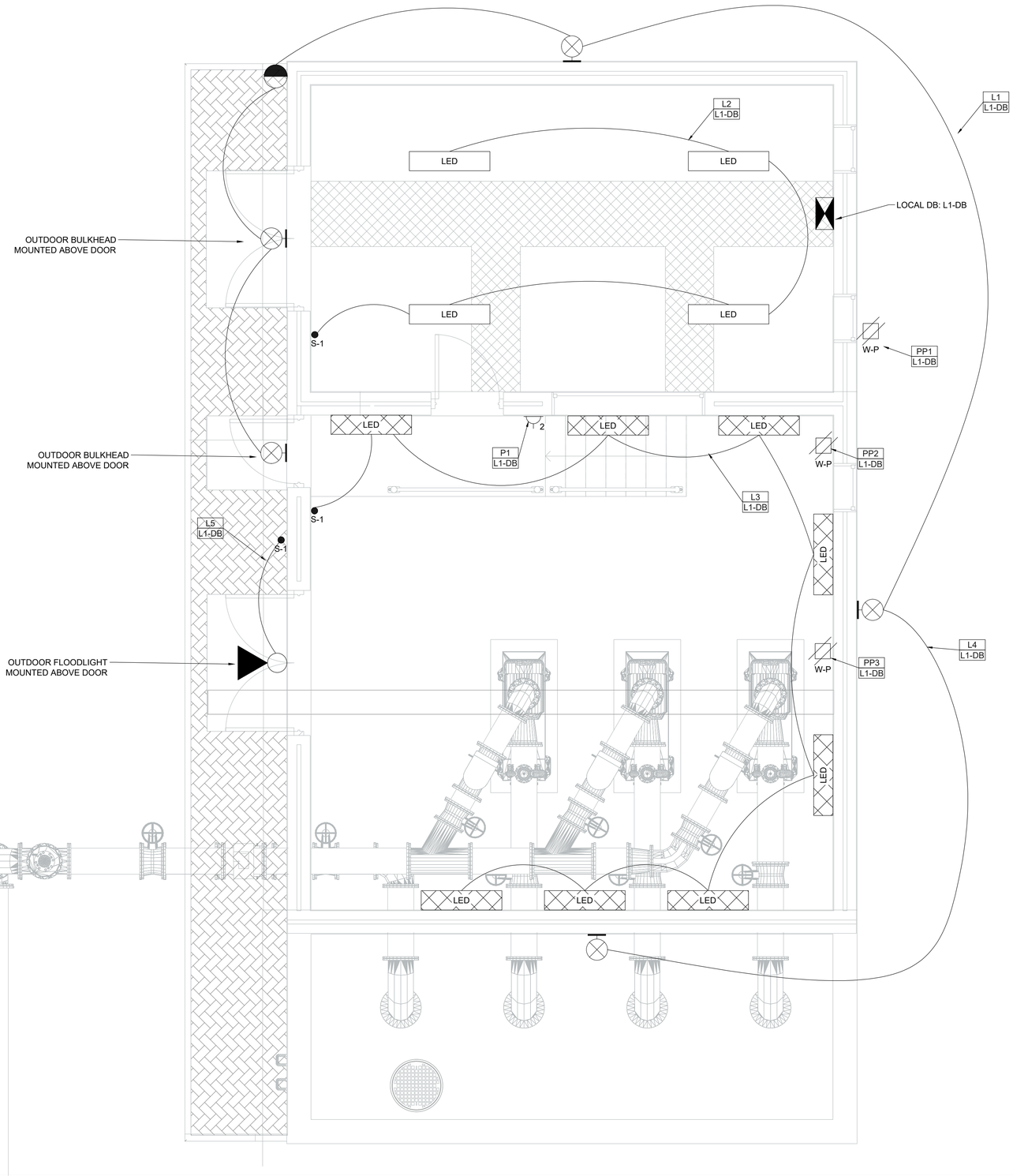
PROJECT
UPGRADE OF BONNIEVALE WTW

TITLE
ELECTRICAL SITE RETICULATION

SCALE	SHEET
on A1 N.T.S.	1 OF 1
CONTRACT No.	PROJECT No. 24203C

DRAWING No. 24203-E-002-01 REV B
COORDINATE SYSTEM: WGS84 / Lo?°

Date: 2026-02-26
Checked:
Auditing: Jarred Carolissen



LIGHTING AND POWER SCHEDULE			
DESCRIPTION	**WATTAGE**	**SYMBOL**	**QTY**
LOCAL DISTRIBUTION BOARD			1
VAPOUR-PROOF LED LUMINAIRE, SOFFIT-MOUNTED	40 W	LED	4
VAPOUR-PROOF LED LUMINAIRE, MOUNTED 2500mm AFFL	40 W	LED	8
OUTDOOR LED FLOODLIGHT, MOUNTED AS INDICATED	60 W		1
SURFACE MOUNTED BULKHEAD LAMP, MOUNTING HEIGHT 2500mm AFFL UNLESS OTHERWISE STATED	40 W		5
PHOTOCELL			1
ONE WAY LIGHT SWITCH SURFACE MOUNTED AT 1100mm AFFL		S-1	3
16A SURFACE-MOUNTED SWITCH SOCKET OUTLET		2	1
SURFACE-MOUNTED ISOLATOR (WEATHERPROOF)		W-P	3
SWITCHING LINE			
CIRCUITING LINE			

NOTE:
BUILDING LAYOUT SHOWN IS INDICATIVE ONLY.
REFER TO CIVIL/STRUCTURAL DRAWINGS FOR DETAILED DRAWINGS

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SCALEBAR
0 30 60
Meters 1:1000

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REVISIONS

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DRAWN	JDC	
CHECKED	CD	

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APPROVED
ENGINEERS: _____
DATE: 2026-03-10

APPROVED
CLIENT: _____
DATE: _____

CLIENT
LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT
UPGRADE OF BONNIEVALE WTW

TITLE
LIGHTING AND POWER DIAGRAM

SCALE	SHEET
on A1 N.T.S.	1 OF 1
CONTRACT No.	PROJECT No. 24203C

DRAWING No. 24203-E-003-01 REV B

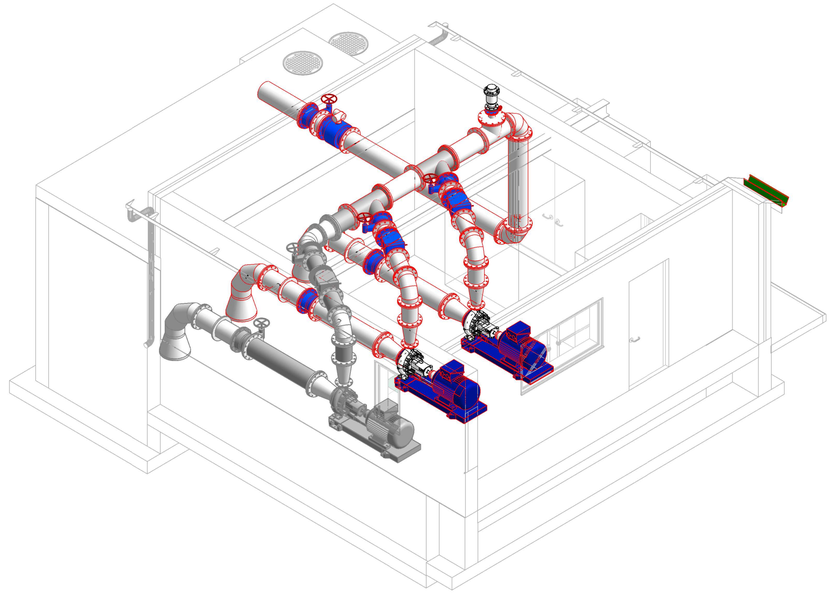
COORDINATE SYSTEM: WGS84 / Lo?°

Auditing: Jarred Cornelissen Checked: Date: 2026-02-27

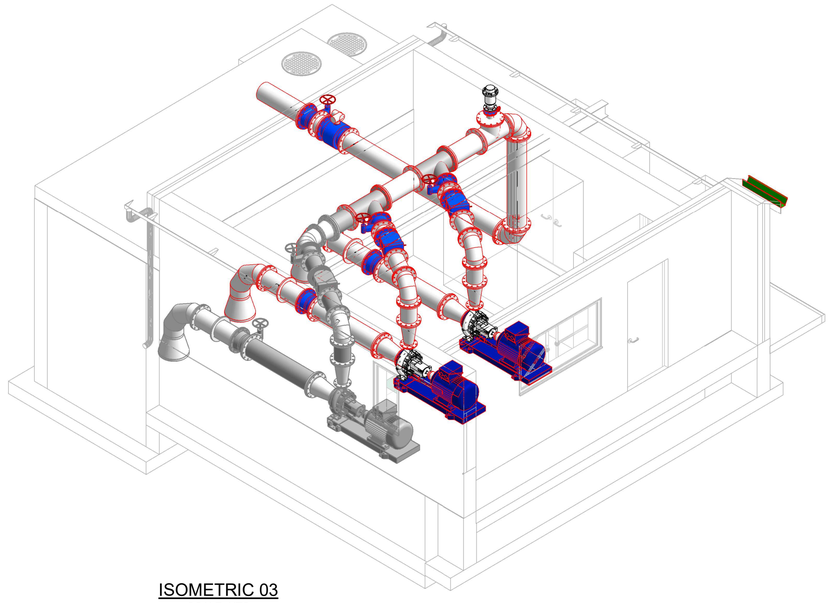
LEGEND :	
FUTURE	



ISOMETRIC VIEW 01
SCALE: NTS



ISOMETRIC VIEW 02
SCALE: NTS



ISOMETRIC 03
SCALE: NTS

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REVISIONS				
REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUE FOR TENDER	2026/03/10		

DESIGNED	MK	
DRAWN	SB	
CHECKED	MK	

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ENGINEERS:
DATE: 2026/03/10

APPROVED:
CLIENT:
DATE:

CLIENT:
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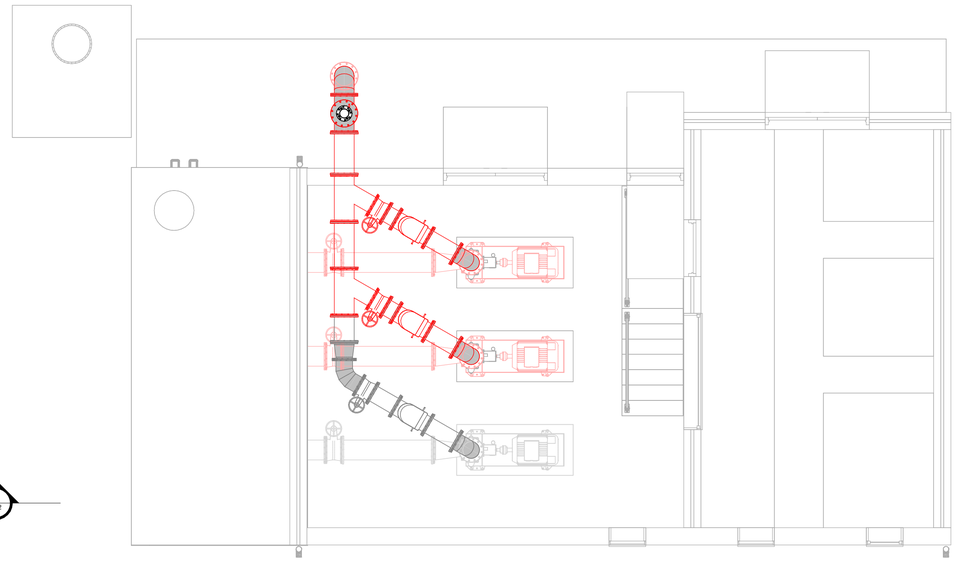
PROJECT NAME
UPGRADE OF BONNIEVALE TREATMENT WORKS

TITLE
ISOMETRIC VIEWS

SCALE ON A1	SHEET
1 : 25	
CONTRACT NO	PROJECT NO
	24203-M

DRAWING NO: 24203-M-050
REV NO: A
COORDINATE SYSTEM:

LEGEND :	
FUTURE	



MAIN MANIFOLD

SCALE 1 : 50

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUE FOR TENDER	2026/03/10		

REVISIONS

DESIGNED	MK	
DRAWN	SB	
CHECKED	MK	

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APPROVED:

ENGINEERS:

DATE: 2026/03/10

APPROVED:

CLIENT:

DATE:

CLIENT:

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADE OF BONNIEVALE TREATMENT WORKS

TITLE

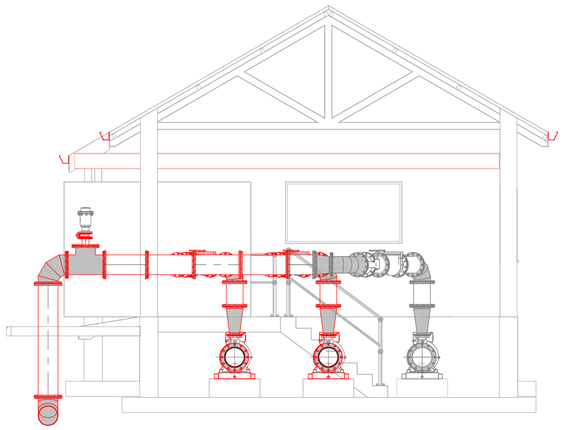
FOUNDATION LAYOUTS

SCALE ON A1	SHEET
As indicated	
CONTRACT NO	PROJECT NO
	24203-M

DRAWING NO: 24203-M-051 REV NO: A

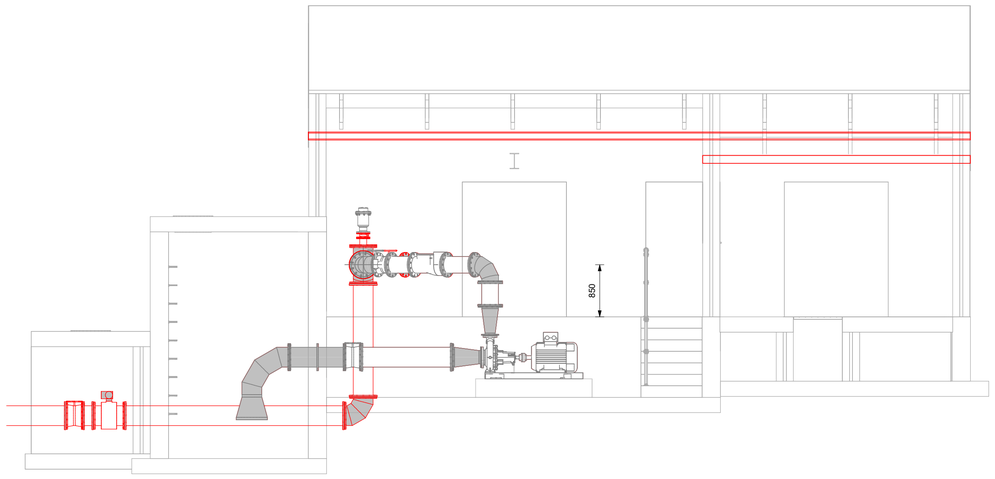
COORDINATE SYSTEM:

LEGEND :	
FUTURE	



SECTION A

SCALE 1 : 50



SECTION B

SCALE 1 : 50

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUE FOR TENDER	2026/03/10		

REVISIONS

DESIGNED	MK	
DRAWN	SB	
CHECKED	MK	

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ENGINEERS:

DATE: 2026/03/10

APPROVED:

CLIENT:

DATE:

CLIENT:

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PROJECT NAME

UPGRADE OF BONNIEVALE TREATMENT WORKS

TITLE

SECTION A & B

SCALE ON A1	SHEET
As indicated	
CONTRACT NO	PROJECT NO
	24203-M

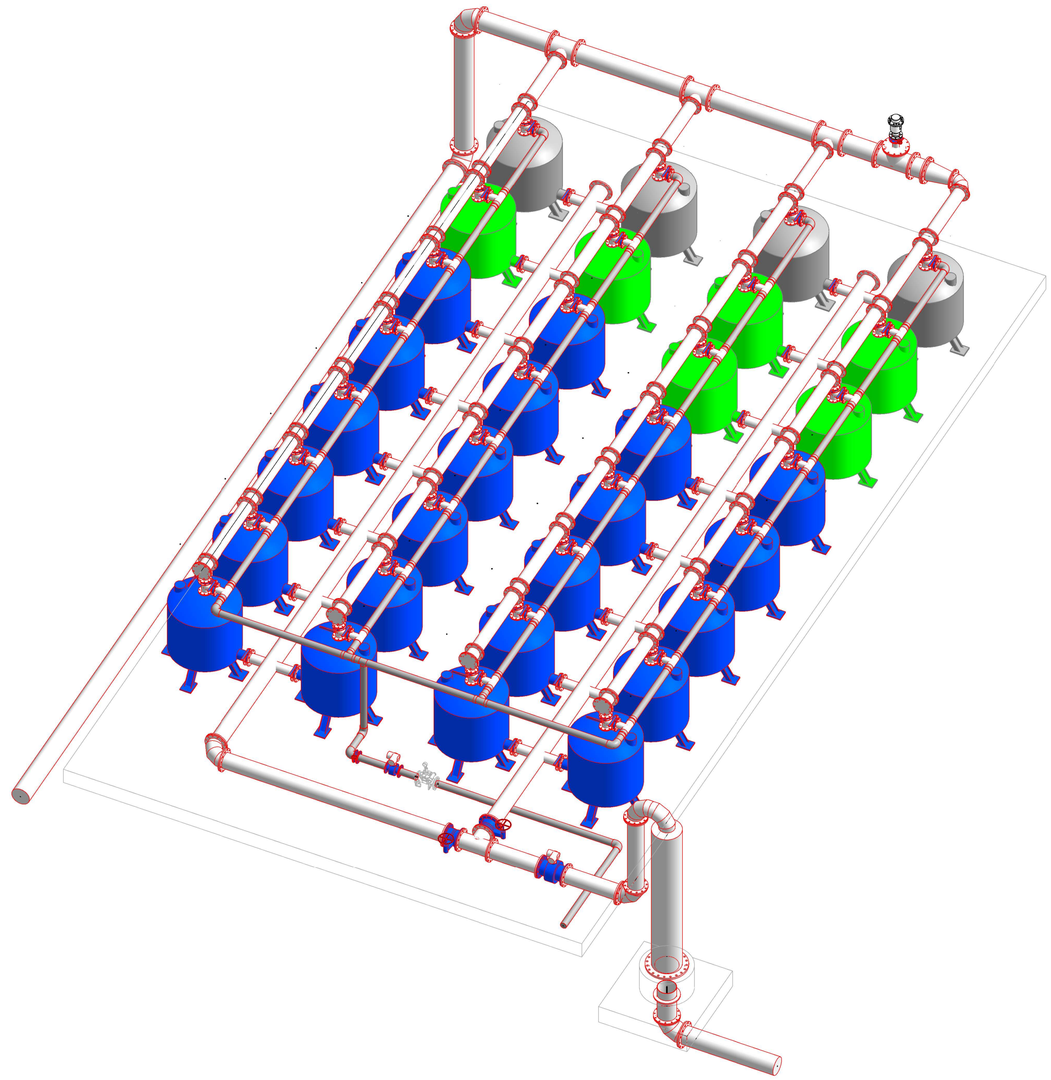
DRAWING NO: 24203-M-052 REV NO: A

COORDINATE SYSTEM:

NOTES :	
EXISTING EQUIPMENT	
NEW EQUIPMENT	
FUTURE	



ISOMETRIC VIEW 01
SCALE: NTS



ISOMETRIC VIEW 02
SCALE: NTS

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUE FOR TENDER	2026-03-10		

REVISIONS

DESIGNED	MK	
DRAWN	SB	
CHECKED	MK	

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APPROVED:
ENGINEERS:
DATE: 2026/03/10

APPROVED:
CLIENT:
DATE:

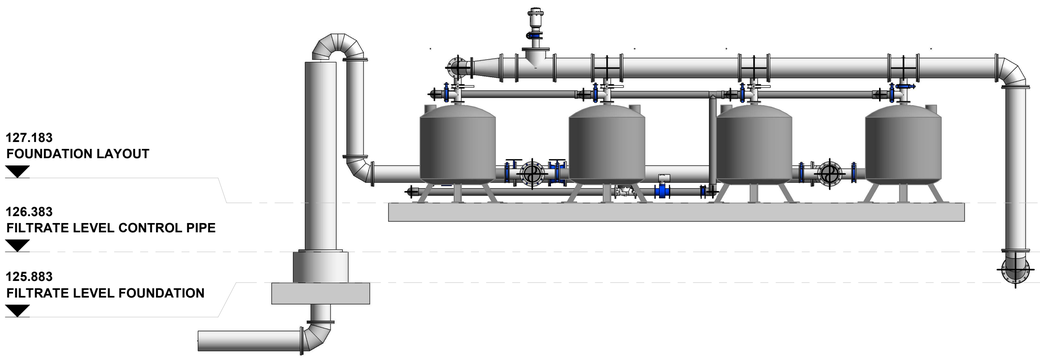
CLIENT:
LANGEBERG
MUNISIPALITEIT/MUNICIPALITY/MASIPALA

PROJECT NAME
UPGRADE OF BONNIEVALE TREATMENT WORKS

TITLE
ISOMETRIC VIEWS

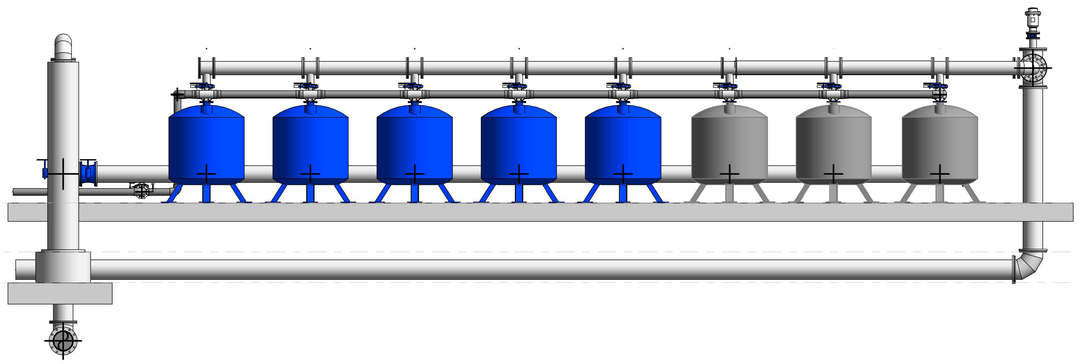
SCALE ON A1	SHEET
1 : 50	
CONTRACT NO	PROJECT NO
	24203

DRAWING NO: 24203-M-060
REV NO: A
COORDINATE SYSTEM:



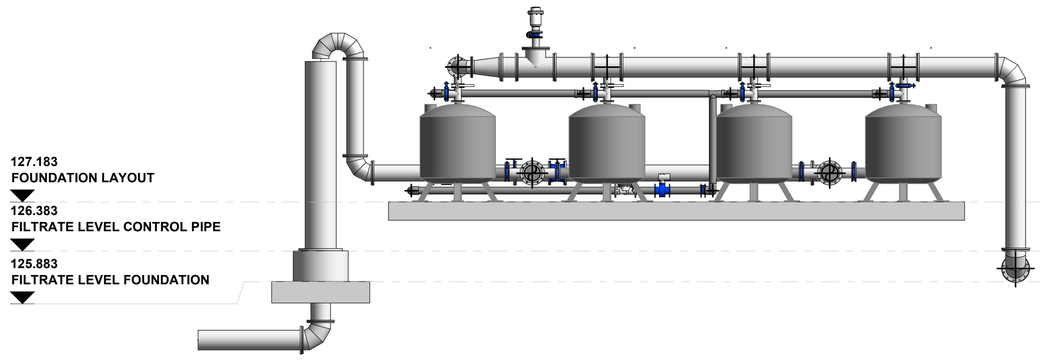
NORTH ELEVATION

SCALE 1 : 50



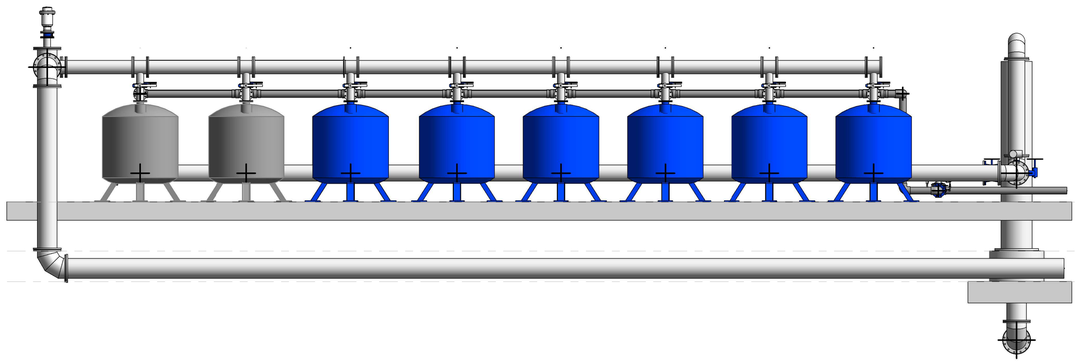
EAST ELEVATION

SCALE 1 : 50



SOUTH ELEVATION

SCALE 1 : 50



WEST ELEVATION

SCALE 1 : 50

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUE FOR TENDER	2026-03-10		

REVISIONS

DESIGNED	MK	
DRAWN	SB	
CHECKED	MK	

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ENGINEERS:

DATE: 2026/03/10

APPROVED:

CLIENT:

DATE:

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LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADE OF BONNIEVALE TREATMENT WORKS

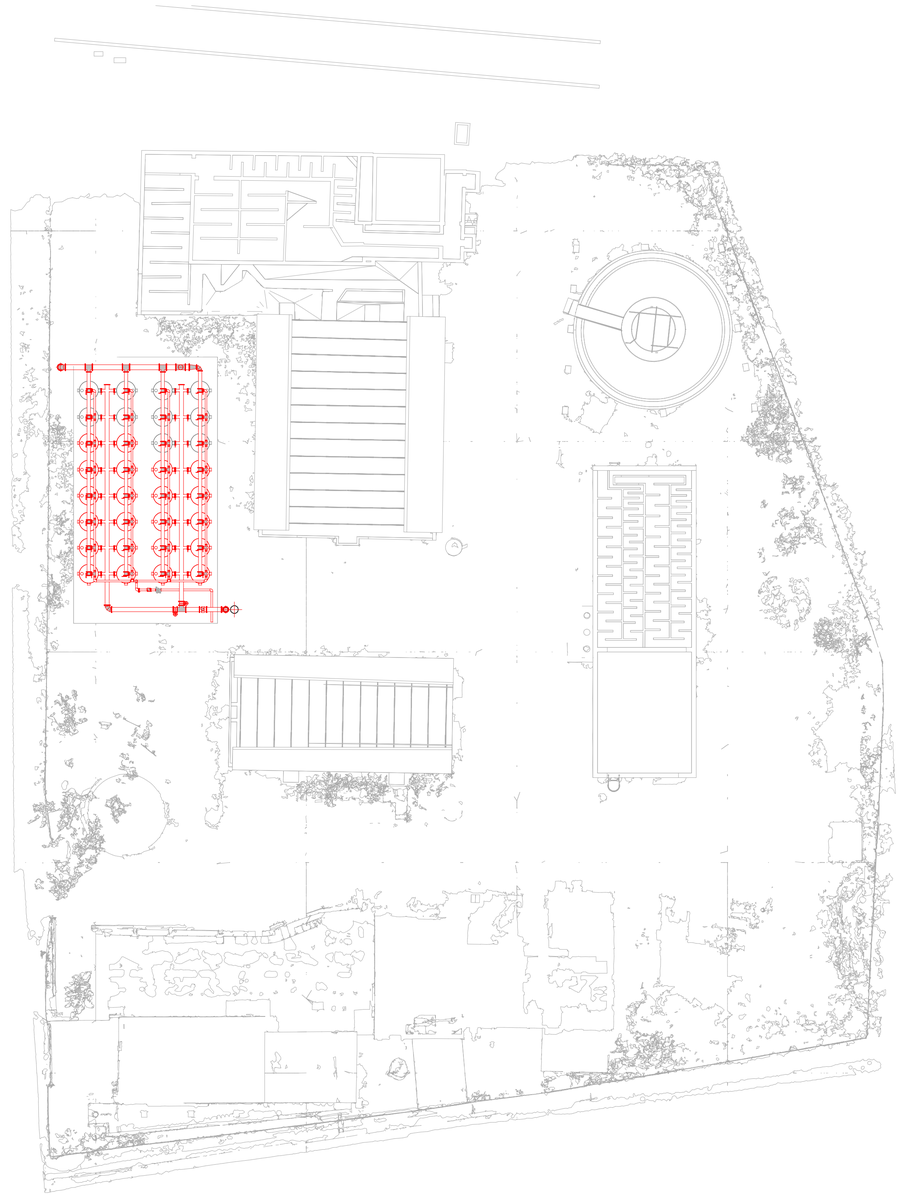
TITLE

ELEVATIONS

SCALE ON A1	SHEET
1 : 50	
CONTRACT NO	PROJECT NO
	24203

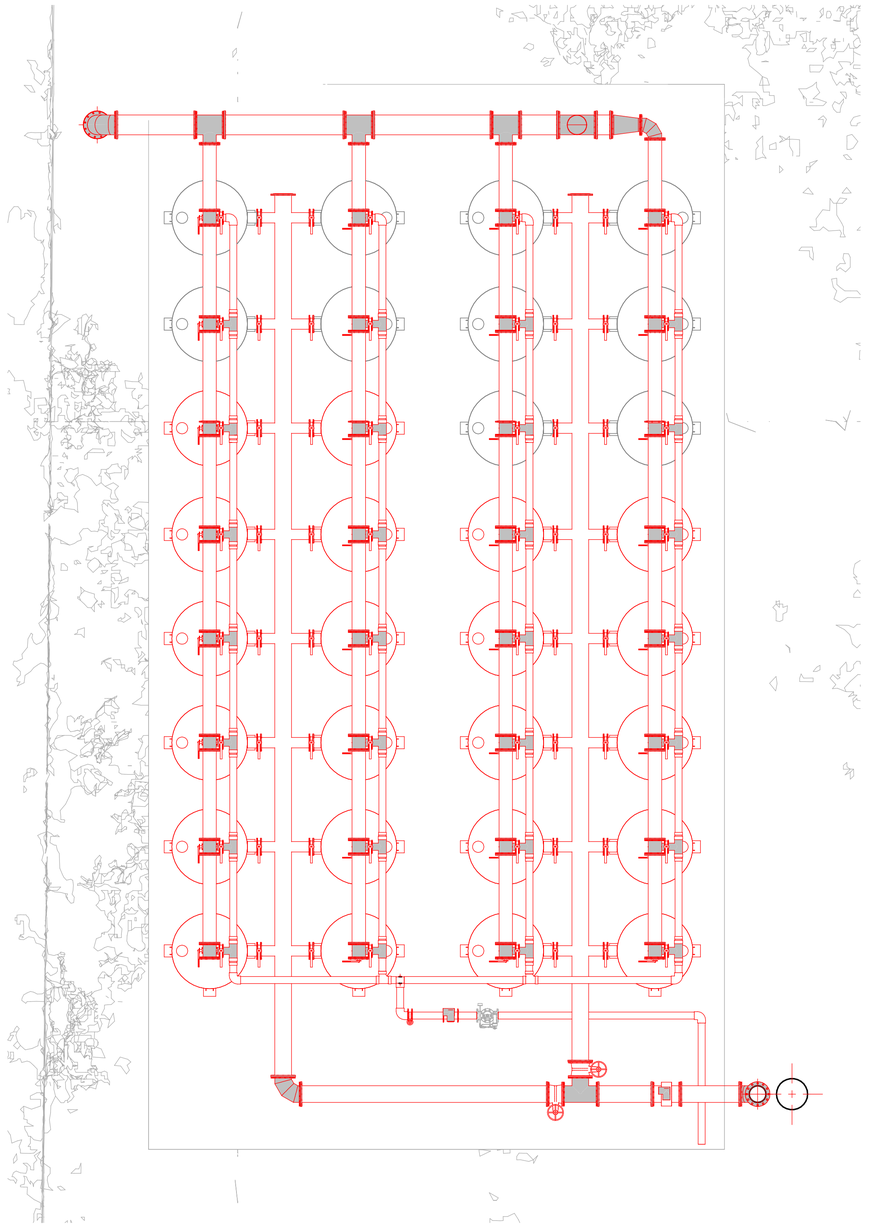
DRAWING NO: 24203-M-061 REV NO: A

COORDINATE SYSTEM:



SITE LAYOUT

SCALE 1 : 200



FOUNDATION LAYOUT

SCALE 1 : 50

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

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REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUE FOR TENDER	2026-03-10		

REVISIONS

DESIGNED	MK	
DRAWN	SB	
CHECKED	MK	

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APPROVED:

ENGINEERS:

DATE: 2026/03/10

APPROVED:

CLIENT:

DATE:

CLIENT:

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

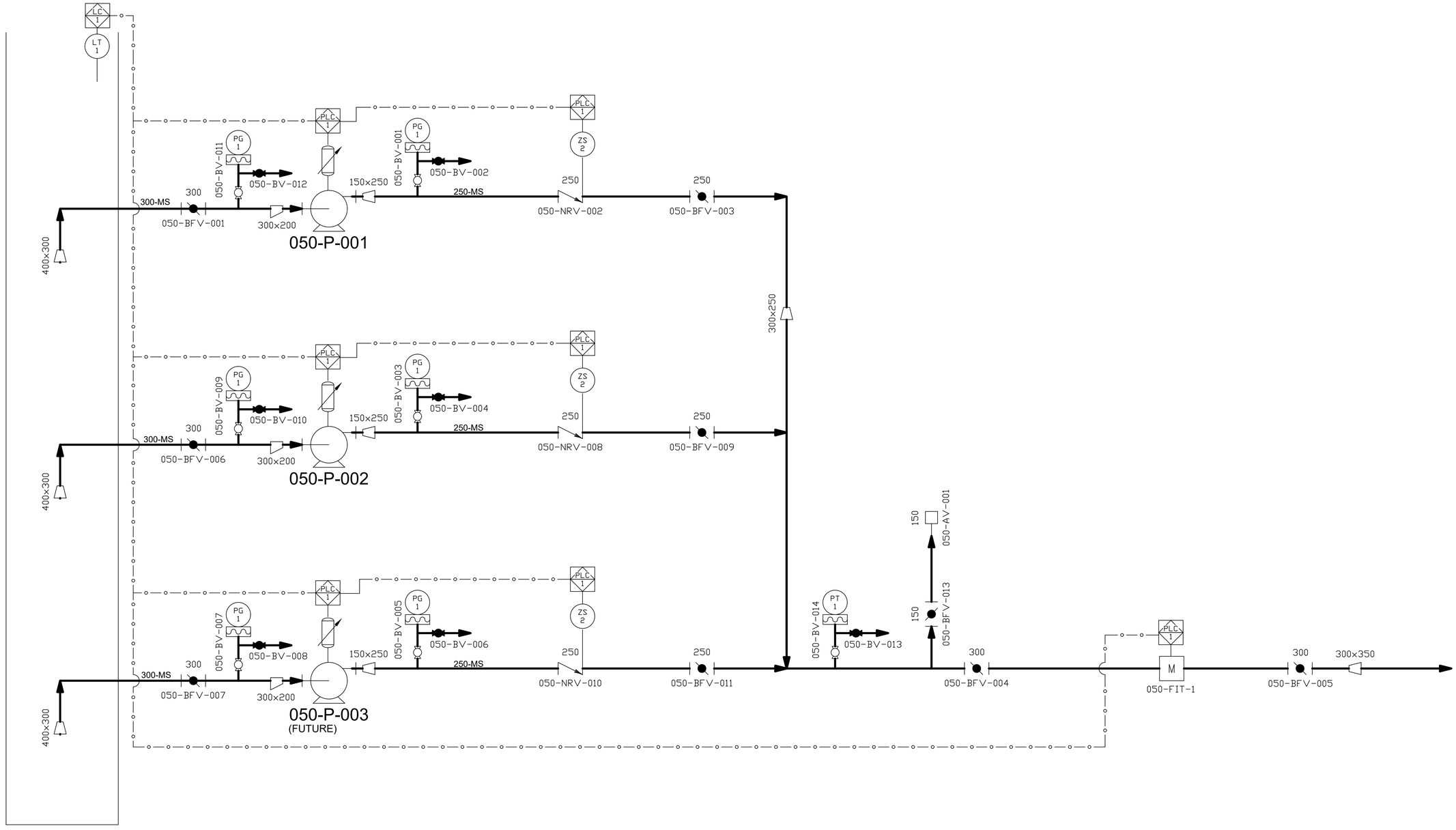
UPGRADE OF BONNIEVALE TREATMENT WORKS

TITLE

PRESSURE FILTER LAYOUTS

SCALE ON A1: As indicated	SHEET:
CONTRACT NO:	PROJECT NO: 24203
DRAWING NO: 24203-M-062	REV NO: A
COORDINATE SYSTEM:	

050-TK-001



FILTER FEED SUMP

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REV	DESCRIPTION	DATE	REV BY	CHKD
00	ISSUED FOR TENDER	2026-03-10	SB	MK

REVISIONS

DESIGNED	MK	
DRAWN	SB	
CHECKED	MK	

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DATE: 2026-03-10

APPROVED:

CLIENT:

DATE:

CLIENT:

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADING OF BONNIEVALE WTW

TITLE

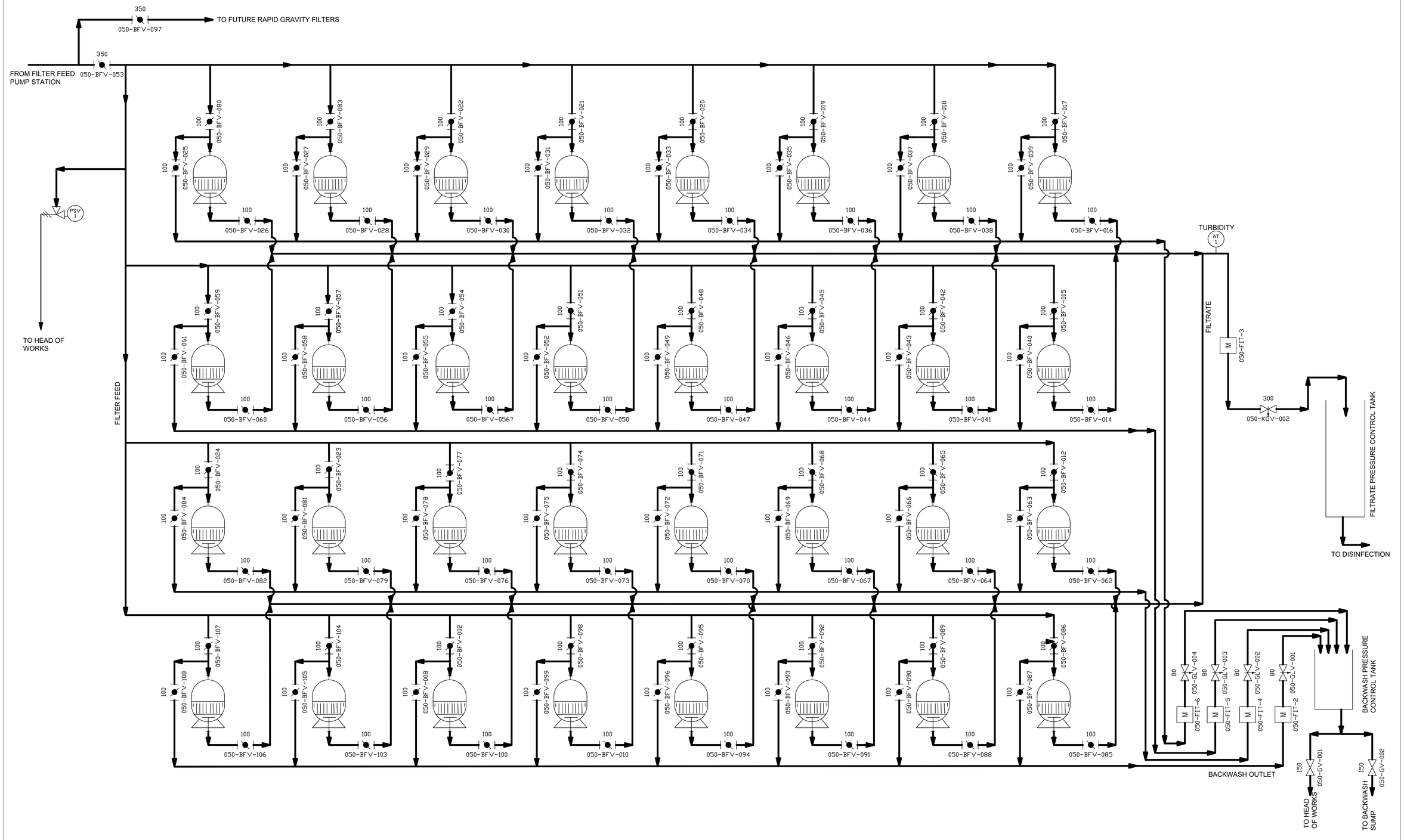
FILTER FEED PUMP STATION P&ID

SCALE ON A1	SHEET
NTS	1 OF 1
CONTRACT NO	PROJECT NO
	24203

DRAWING NO:	REV NO:
24203-P-50	A

COORDINATE SYSTEM: WGS84/Lo19°

iso A1 (841.00 x 594.00 mm)



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REV	DESCRIPTION	DATE	REV BY	CHKD
00	ISSUED FOR TENDER	2026-03-10	SB	MK

REVISIONS

DESIGNED	MK	
DRAWN	SB	
CHECKED	MK	

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APPROVED:

ENGINEERS: _____

DATE: 2026-03-10

APPROVED:

CLIENT: _____

DATE: _____

CLIENT:

LANGEBERG
HUNISIPALITEIT MUNICIPALITY MASIPALA

PROJECT NAME

UPGRADING OF BONNIEVALE WTW

TITLE

PRESSURE FILTER P&ID

SCALE ON A1	SHEET
NTS	1 OF 1
CONTRACT NO	PROJECT NO
	24203

DRAWING NO: 24203-P-60 REV NO: A

COORDINATE SYSTEM: WGS84/Lo19°

iso A1 (841.00 x 594.00 mm)