
PHUMELELA LOCAL MUNICIPALITY



BID NO.: PLMT 24-25/01

**APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT
OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS**

BID DOCUMENT (VOLUME 1 OF 2)

CLOSING DATE: 08 November 2024

CLIENT:

PHUMELELA LOCAL MUNICIPALITY
52 KUHN STREET
VREDE
9835

TEL: 061 463 0315



CONTACT PERSON: MR S MASOEU

CONSULTANT:

AFRICAN ENGINEERING AND
CONSTRUCTION SOLUTIONS
3 KLOOF STREET
BETHLEHEM
9701

TEL: 058 303 1269



CONTACT PERSON: MR TW BARTLEMAN

NAME OF BIDDER:

BID AMOUNT (INCLUDING VAT):

CONTRACT PERIOD (WEEKS):



General Bid Information

TENDER ADVERTISED	:	20 September 2024
ESTIMATED CIDB CONTRACTOR GRADING : DESIGNATION	:	6ME and 4CE or above
SITE VISIT/CLARIFICATION MEETING	:	18 October 2024 @ 11:00
VENUE FOR SITE VISIT/CLARIFICATION MEETING	:	Vrede/Thembahlile WWTW GPS: 27°23'56.88"S, 29°10'49.68"E
CLOSING DATE	:	08 November 2024
CLOSING TIME	:	12:00pm
TENDER BOX & ADDRESS	:	The bid box at the entrance of: 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, the tender box No. and the closing date indicated on the envelope. The sealed envelope must be inserted into the appropriate official tender box before closing time. If the tender offer is too large to fit into the abovementioned box or the box is full, please enquire at the public counter 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.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



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Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



PHUMELELA LOCAL MUNICIPALITY

BID NUMBER : PLMT 24-25/01

APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS

THE TENDER: PART T1

PART 1 (OF 2): TENDERING PROCEDURES

CONTENTS

T1.1	Tender Notice and Invitation to Tender
T1.2	Tender Data
T1.3	General Bid Condition

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



T1.1: Tender Notice and Invitation to Tender



Phumelela Local Municipality hereby invites interested prospective bidders to submit offers for the following proposal:

BID NO.	DESCRIPTION	BID AMOUNT	EVALUATION CRITERIA	CIDB GRADING	CONTACT PERSON	COMPULSORY BRIEFING DATE	CLOSING DATE FOR TENDERS
PLMT 24-25/01	Appointment of a Contractor for The Refurbishment of Vrede / Thembalihle wastewater treatment works	Non-Refundable Fee: R1000.00	80/20	6ME and 4CE or above	Jane Mkotwane Tel:072086442/ S. Masoeu: Tel:0614630315 pmu.coordinator@phumelela.gov.za	1 October 2024 11:00 – 12:00 (52 Kuhn Street, Vrede)	1 November 2024 @12:00pm

BID DOCUMENTS WILL BE AVAILABLE FROM 1 OCTOBER 2024 FROM 08:00 AM TO 15:30 PM (MONDAY - FRIDAY), until the closing date, upon payment of a cash non-refundable fee.

Payment of the non-refundable fee of R1 000.00 can be made at the cashiers at the main Municipal Building, 52 Kuhn Street, Vrede or directly into the municipal bank account. Proof of EFT payment should then be forwarded to the SCM office via email to scm@phumelela.gov.za or demand@phumelela.gov.za.

Bidders must take note of the following:

- Bids must be submitted on the original document and remain valid for 90 days after the closing date
- No telegraphic, telefax and late bids will be accepted
- Valid company Tax Compliance Status must be attached.
- CSD registration report must be attached
- CIDB grading with a minimum designation of 6ME and 4CE or above must be attached.
- Bidders must submit company's proof of payment of municipal services not older than 3 months or a lease agreement
- The municipality is not bound to accept the lowest bid or part of any bid
- Bidders must obtain a minimum score 70 or more points in functionality in order to be evaluated further for price and preference
- The 80/20 evaluation criteria will be used as per the preferential procurement policy framework act 5 of 2000 and its regulations
- No bid will be accepted from persons in the service of the state.

Municipal Manager
Mrs. GPN Mhlongo-Ntshangase

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**ERRATUM**

**PLEASE NOTE THE FOLLOWING CHANGES MADE TO THE ADVERT THAT WAS
PUBLISHED ON E-TENDER AND CIDB WEBSITE**

Phumelela Local Municipality hereby invites interested prospective bidders to submit offers for the following proposal:

BID NO.	DESCRIPTION	BID AMOUNT	EVALUATION CRITERIA	CIDB GRADING	CONTACT PERSON	COMPULSORY BRIEFING DATE	CLOSING DATE FOR TENDERS
PLMT 24-25/01	Appointment of a Contractor for The Refurbishment of Vrede / Thembalihle wastewater treatment works	Non-Refundable Fee: R1000	80/20	6ME and 4CE or above	Jane Mkotwane Tel: 072086442/ S Masoeu Tel: 0614630315 pmu.coordinator@phumelela.gov.za	11 October 2024 11:00 – 12:00 (52 Kuhn Street, Vrede)	11 November 2024 @12:00pm

BID DOCUMENTS WILL BE AVAILABLE FROM 11 OCTOBER 2024 FROM 08:00 AM TO 15:30 PM (MONDAY - FRIDAY), until the closing date, upon payment of a cash non-refundable fee.

Payment of the non-refundable fee of R1000.00 can be made at the cashiers at the main Municipal Building, 52 Kuhn Street, Vrede or directly into the municipal bank account. Proof of EFT payment should then be forwarded to the SCM office via email to scm@phumelela.gov.za or demand@phumelela.gov.za.

No bid will be accepted from persons in the service of the state.

Bids will remain valid for 90 days.

Preference will be given to Respondents based on their BBEE status.

Bidders must take note of the following:

- Bids must be submitted on the original document and remain valid for 90 days after the closing date
- No telegraphic, telefax and late bids will be accepted
- Valid company Tac Compliance Status must be attached.
- CSD registration report must be attached
- CIDB grading with a minimum designation of 6ME and 4CE or above must be attached.
- Bidders must submit company's proof of payment of municipal services not older than 3 months or a lease agreement
- The municipality is not bound to accept the lowest bid or part of any bid
- Bidders must obtain a minimum score 70 or more points in functionality in order to be evaluated for price and preference
- The 80/20 evaluation criteria will be used as per the preferential procurement policy framework act 5 of 200 and its regulations.
- No bid will be accepted from persons in the service of the state.

Municipal Manager
Mrs. GPN Mhlongo-Ntshangase

**ERRATUM**

**REFERENCE: REFURBISHMENT OF VREDE / THEMBALIHLE
WASTEWATER TREATMENT WORKS
BID NUMBER: PLMT 24-25/01**

Please note the following changes made to the bid advert placed on e-tender, CIDB website, municipal website and City press

1. Compulsory briefing session will be held on 18 October 2024 at 11h00, 52 Kuhn street, Vrede 9835
2. The new closing date of the bid will be on 8 November 2024 at 12h00, 52 Kuhn street, Vrede 9835
3. Bid documents will be available from 15 October 2024 at Vrede municipal offices for a non-returnable fee of R 1000,00
4. All the other details remain the same

Municipal Manager
Mrs. GPN Mhlongo-Ntshangase

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



T1.2: Tender Data

TENDER DATA

The conditions of bid are the **Standard Conditions of Tender** as contained in Annexure C of the CIDB Standard for Uniformity in Construction Procurement, as printed in the **Government Gazette No 42622** dated **8 August 2019**.

The under mentioned items of data and deviations will have precedence over the Standard Conditions of bid conditions.

The **Standard Conditions of Bid** for Procurements make several references to the bid data for details that apply specifically to this bid. The bid data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the standard conditions of bid.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Clause number	Data
C1.1 ACTIONS	The Employer is: Phumelela Local Municipality 52 Kuhn Street Vrede 9835
C1.2 TENDER DOCUMENTS	The bid documents issued by the Employer comprise: Part T1: Tendering Procedures Part T2: Returnable Documents Part C1: Agreement and Contract Data Part C2: Pricing Data Part C3: Scope of Works and Specifications Part C4: Site Information Part C5: Annexures
C1.4 COMMUNICATION AND EMPLOYER'S AGENT	The Employer's Agent is: African Engineering and Construction Solutions 3 Kloof Weg Street Bethlehem 9701 Tel no.: 058 303 1269
C2.1 ELIGIBILITY	Only those bidders who are registered with the CIDB in a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the sum tendered for a 6ME 4CE or above class of construction work. Joint Ventures are eligible to submit bids provided that: I. each member of the joint venture is registered with the CIDB, II. the lead partner has a contractor grading designation in the 6ME or above class of construction work; and III. the combined contractor grading designation calculated in accordance with the Construction Industry Development Regulations (according to the CIDB website Joint Venture Grading Designation Calculator) is equal to or higher than a contractor grading designation determined in accordance with the sum tendered for an 6ME 4CE or above class of construction work. As included in the Evaluation Criteria - Functionality
C.2.7 CLARIFICATION MEETING	Compulsory Briefing will be held on 18 October 2024 at 11:00am at the VREDE / THEMBALIHLE WWTW. GPS: 27°23'56.88"S, 29°10'49.68"E
C.2.13.3	The whole original bid document, as issued by the Phumelela Local Municipality, shall be submitted. Bids may only be submitted on the Bid documentation issued by the Phumelela Local Municipality.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause number	Data
SUBMITTING A TENDER OFFER	
C.2.13.5 SUBMITTING A TENDER OFFER	The Employer's address for delivery of bid offers and identification details to be shown on each bid offer package are: NB: The Municipality will not be held liable for tenders posted via Post Office not yet collected. Tender box location : Phumelela Local Municipality, Ground Floor Physical address : 52 Kuhn Street Vrede 9835 Identification details: PLMT 24-25/01 - APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS The name and address of the bidder shall be entered on the back of the envelope.
C.2.15 CLOSING TIME	The closing time for submission of bid offers is: <u>08 November 2024 at 12:00pm.</u> Telephonic, telegraphic, telex, facsimile or e-mailed bid offers will not be accepted.
C.2.16 BID OFFER VALIDITY	The bid offer validity period is 90 days.
C.2.19 INSPECTIONS, TESTS AND ANALYSIS	Access shall be provided for inspections, tests and analysis as may be required by the Employer.
C.2.23 CERTIFICATES	The bidder is required to submit with his bid: 1. Valid company Tax Compliance Status (<i>Pin Confirmation Letter</i>) be attached. 2. Copy of the company registration certificate / founding certificate must be attached. 3. Copy of company profile with clear references. 4. Valid BBBEE verification certificate/ Sworn Affidavit must be attached. 5. CSD registration report/support number. 6. Valid letter of good standing (COIDA). 7. Copy of CIDB grading with a minimum designation of 6ME 4CE or above. 8. Municipal rates & taxes information in the bid document must be duly completed by your Local Municipality or your Landlord. 9. Original bank rating certificate.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause number	Data
	10. CV's with qualifications of all supervisory and safety personnel. 11. Project Execution Plan. 12. Three (3) years recent (from 2019 to current) Audited Financial Statements, signed by registered accountant and approved by directors. 13. All compulsory/ supplementary forms must be fully completed that is (MBD 1, 4, 6, 8 and 9).
C.3.5 TWO-ENVELOPE SYSTEM	A two-envelope procedure will not be followed.
C.3.9.1 ARITHMETICAL ERRORS	Refer to C.3.9 Arithmetical errors and imbalanced unit rates
C.3.11 EVALUATION OF BID OFFERS	The preference procedure for evaluation of responsive bid offers shall be the 80/20- point preference system, being a maximum of 80 points for price and a maximum of 20 points for Specific goal of the PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT, 2000: PREFERENTIAL PROCUREMENT REGULATIONS, 2022, in full compliance with Form 2.3.3.
C.3.13 ACCEPTANCE OF BID OFFER	Bids containing any one or more of the errors or omissions, or bids not having complied with any one of the peremptory bid conditions as detailed in this bid document, shall not be considered and shall automatically be rejected.
C3.15 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.3.17 PROVIDE COPIES OF CONTRACTS	The number of paper copies of the signed contract to be provided by the Employer is one .
ADDITIONAL CONDITIONS APPLICABLE TO THIS BID	The additional conditions of bid are: 1. The Employer/Client's Representative may also request that the bidder provide written evidence that his financial, labour and other resources are adequate for carrying out the contract. 2. The Employer reserves the right to appoint a firm of chartered accountants and auditors and/or execute any other financial investigations on the financial resources of any bidder. The bidder shall provide all reasonable assistance in such investigations. 3. The Employer will not appoint more than one Contractor on this project.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause number	Data			
	4. The bid document shall be submitted as a whole and shall not be taken apart. Failure will result in disqualification 5. List of returnable documents must be completed in full. (A bidder's company profile will not be used by the DHS to complete this part on behalf of the bidder) NB: If the returnable documents section is not completed in full by the bidder, this offer will be rejected.			
FUNCTIONALITY	Only those tenderers who score a minimum of 70 points in respect of the following criteria are eligible for further evaluation.			
	Criteria	Weight	Points allocated	Documents to be submitted as proof to score points
	Number of projects related to Construction (Water and Sewer)/Refurbishment of Wastewater Treatment Works successfully completed. 0 projects 1 of R10m and above project 2 of R10m and above projects 3 of R10m and above projects 4 of R10m and above projects 5 of R10m and above projects	0 1 2 3 4 5	50	Attach <i>signed appointment and completion letters of similar projects (Construction/Refurbishment of Wastewater Treatment Works)</i> completed <i>with contact details for references</i> that can be contacted by the Municipality to confirm that project was done.
	Personnel references Project manager (<i>specify in CV</i>) NQF LEVEL 7, (Civil/Electrical/Mechanical/Project management), Pr. Eng./Pr. Tech Eng./Pr. CPM 0 projects 1 of R10m and above project. 2 of R10m and above projects 3 of R10m and above projects 4 of R10m and above projects 5 of R10m and above projects	0 1 2 3 4 5	10	Provide the name(s) of your key personnel with list of similar projects of from R10m or more they have completed and their certified qualifications

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Clause number	Data			
	Millwright (specify in CV) NQF LEVEL 4 (Occupational Certificate) 0 projects 1 of R10m and above project 2 of R10m and above projects 3 of R10m and above projects 4 of R10m and above projects 5 of R10m and above projects	0 1 2 3 4 5	10	Provide the name(s) of your key personnel with list of similar projects from R10m or more they have completed and their certified qualifications
	Master Electrician (specify in CV) NQF LEVEL 4 (Occupational Certificate) 0 projects 1 of R10m and above project. 2 of R10m and above projects 3 of R10m and above project 4 of R10m and above projects 5 of R10m and above projects	0 1 2 3 4 5	8	Provide the name(s) of your key personnel with list of similar projects from R10m or more they have completed and their certified qualifications
	Site Agent (Specify in CV) NQF LEVEL 6 (Built Environment), Pr Eng / Pr Tech Eng / Pr Techni Eng 0 projects 1 of R10m and above project. 2 of R10m and above projects 3 of R10m and above projects 4 of R10m and above projects 5 of R10m and above projects	0 1 2 3 4 5	10	Provide the name(s) of your key personnel with list of similar projects of from R10m or more they have completed and their certified qualifications
	Health and Safety Officer (Specify in CV) NQF LEVEL 4, (OHS) / Pr CHSA 0 projects 1 of R10m and above project. 2 of R10m and above projects 3 of R10m and above projects 4 of R10m and above projects 5 of R10m and above projects	0 1 2 3 4 5	5	Provide the name(s) of your key personnel with list of similar projects of from R10m or more they have completed and their certified qualifications

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause number	Data			
	Locality			
	Outside Free State	0		
	Within Free State	1		
	Within Thabo Mofutsanyana District	3	7	
	Within Phumelela	5		
	TOTAL MAX. POINTS		100	
NB! NO PERSONNEL WILL OCCUPY TWO POSITIONS IN THIS TENDER, EVERY POSITION MUST EACH HAVE DEDICATED PERSONNEL.				
PREFERENCE POINT SYSTEM	<u>Points Awarded for Price (Ps)</u>			
	The following formula will be used to calculate the points out of 80 for price in respect of a tender with a Rand value above R2 000.00 and up to a Rand value of R50 million, inclusive of all applicable taxes less all unconditional discounts.			
	(1) A maximum of 80 points is allocated to Price on the following basis;			
	$Ps = 80 \left[1 - \frac{(Pt - Pmin)}{Pmin} \right]$			
	Where Ps = Points scored for price of tender under consideration.			
	Pt = Rand value of the tender under consideration.			
	Pmin = Rand value of the lowest acceptable tender.			
	(2) A maximum of 20 points may be awarded to a tenderer for the specific goal specified for the tender. Phumelela Local Municipality will be using the following criteria to award points for specific goal:			
	<u>Specific goal</u>	<u>Applicable weight [80:20]</u>	<u>Applicable weight [90:10]</u>	<u>Evidence to be submitted by the supplier to substantiate the points claimed/allocated per specific goal (NB: Any of the evidence indicated below per specific goal should be regarded as sufficient)</u>
	EME or QSE	6	3	- Sworn affidavit signed by the EME or QSE representative and attested by a Commissioner of Oaths - A certified copy of a BB-BEE certificate issued by the verification agency accredited by SANAS - Proof of B-BBEE issued by DTIC

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause number	Data			
	Woman	4	2	- RSA identity document - Valid RSA driver's license issued by the relevant authority
	Youth	4	2	- RSA identity document - Valid RSA driver's license issued by the relevant authority (NB: Youth is defined as any south African citizen with the age between 18 and 35 years)
	People with disability	2	1	Sworn affidavit signed by the company representative and attested by the Commission of oaths
	Free state based company (NB : the institutions must ensure that this specific goal is aligned to the district they are situated in e.g suppliers situated in Thabo Mofutsanyane District	4	2	- Municipal Account - Lease agreement - Title deeds - Permission to occupy land signed by the traditional authority A letter of confirmation of the address signed by the ward councillor
(3) Only the tender with the highest number of points scored may be selected.				
TAX CLEARANCE	A copy of the latest SARS Tax Compliance Status (Pin verification), accompanied by cover letter containing CSD number, must accompany the BID.			
CONTRACT AGREEMENT (FORM OF AGREEMENT)	The contract agreement included in the Bid Documents includes a specific agreement as contemplated in Section 37. (2) of the Occupational Health and Safety Act, 1993 (Act No 85, 1993). This section will only be completed upon the appointment of a successful Bidder.			
INSURANCE	The Bidder's attention is drawn to the General Conditions of Contract in terms of which the contractor will affect and pay for Contract works and Public Liability (Third Party Liability) Insurance, and the care of the works for the sum of not less than the contract amount. The contractor shall provide the proof to the employer that the contractor is in compliance with the Insurance requirements and in good standing with respect to duties, taxes and all other contributions required in terms of legislation applicable to the scope in the Contract.			

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause number	Data
SCOPE OF THE CONTRACT	Tenderers should tender for the contract as a whole. The strict time frame and appropriate skills required should not prevent the Tenderer to use local labour of suitable skills levels. The Employer reserves the right not to award the bid in full and may omit any part of the scope. The Employer also reserves the right to appoint a Bidder for a lesser amount with a reduced scope, which is to be negotiated by the Employer with the successful bidder. Phumelela Local Municipality fully reserve the right not to accept the lowest tender.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



T1.3: GENERAL BID CONDITIONS

GENERAL BID CONDITIONS AND INFORMATION

1. Cost of Bid Documents

Payment for bid document, if specified, must be made to the Phumelela Local Municipality. These costs are non-refundable.

2. Completion of Bid Documents

- a) The original bid document must be completed fully in black ink and signed by the authorised signatory to validate the proposal. All the pages must be initialised by the authorised signatory. Failure to do so will result in the disqualification of the tender.
- b) Bid documents may not be retyped or altered in any way. The complete bid document must be returned.
- c) Missing pages will result in disqualification of the bid.
- d) Any bid document received with correction fluid (Tippex) corrections shall be disqualified.

3. Alteration or Qualification of Bid

No unauthorised alteration of this set of bid documents will be allowed. Any unauthorised alteration will disqualify the proposal automatically. Any ambiguity must be cleared with the contact person for the bid before the closure date.

4. Submission of Bid

- a) By hand: Bid documents and supporting documents must be sealed and externally endorsed with the Bid Name, Bid Number and Bid Description and placed in a bid box, on the Ground Floor, Municipal Building, 52 Kuhn Street, Vrede.
- b) If the bid is late, it will not be accepted for consideration.

5. Opening, Recording and Publications of Bids Received

- a) Bids will be opened immediately after the bid closure date and time as specified in the bid documents. If requested by any bidder present, the names of the bidders, and if practical the total amount of each bid and of any alternative bids will be read out aloud.
- b) Details of bids received in time will be recorded in a register which is open to public inspection.
- c) Faxed and late bids will not be accepted.

6. Company Registration Document

- a) A copy of company registration (CIPC-CK) documents that reflect company name, registration number, date of registration and active directors or members. If no such proof is attached the bid will be disqualified.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



7. Identity Documents

- a) ID (preferably certified) copies not older than six (6) months (180 days) of the company's directors must also be attached. If no ID's are attached the bid will be disqualified.

8. Tax Clearance Certificate (TCC) / Tax Compliance Status Pin Issued (TCS)

- a) A valid original Tax Clearance Certificate or TCS Pin must accompany the bid documents. The onus is on the bidder to ensure that the Municipality has an original Tax Clearance Certificate on record. If the South African Revenue Services (SARS) cannot provide a valid original Tax Clearance Certificate; the bidder must submit a letter from SARS on an original SARS letterhead that their tax matters are in order.
- b) In the case of a Consortium/Joint Venture every member must submit a separate Tax Clearance Certificate or TCS Pin with the bid documents.
- c) If a bid is not supported by a valid original Tax Clearance Certificate or TCS Pin, either as an attachment to the bid documents, the municipality reserves the right to obtain such document after the closing date to verify that the bidder's tax matters are in order. If no such document can be obtained within a period as specified by the Municipality the bid will be disqualified.

9. B-BBEE Certificate / Sworn Affidavit

Only SANAS Accredited B-BBEE Certificate and the Sworn B-BBEE Affidavit- B-BBEE Exempted Micro Enterprise which is signed by the commissioner of oaths will be accepted. The requirement for these certificates are set out in the MBD6.1 (Preference Points claim form in terms of the Preferential Procurement Regulations 2022).

FAILURE TO COMPLY WITH THE ABOVEMENTIONED WILL RESULT IN NO bidder not scoring some of the points on specific goal.

10. Evaluation of Bids

Bids will be evaluated in terms the bid specifications and requirements as well as the 80/20 points system as stipulated in the Preferential Procurement Regulations of 2022 that was promulgated by the Minister of Finance on 04 November 2022 in Government Gazette No 47452 such additional criteria as set out in this bid document.

11. Acceptance or Rejection of a Bid

The Phumelela Local Municipality reserves the right to withdraw any invitation to submit a bid and/or to re-advertise or to reject any bid or to accept any quotation in whole or a part of it. The Phumelela Local Municipality does not bind itself to accepting the lowest bid or the bid scoring the highest points. The Municipality reserves the right to accept more than one bid (in the event of a number of items being offered).

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**12. Registration on the Central Supplier Database (CSD)**

- a) It is expected of all prospective service providers who are not yet registered on the Central Supplier Database CSD Website at www.csd.gov.za. to register without delay.
- b) The municipality is not allowed to do any business with suppliers who are not registered on the CSD.

13. Site / Information Meetings (If applicable)

- a) Site or information meetings, if specified, are compulsory. Bids will not be accepted from bidders who have not attended compulsory site or information meetings. Bidders that arrive 15 minutes or more after the advertised time the meeting starts will not be allowed to attend the meeting or to sign the attendance register. If a bidder is delayed, he must inform the contact person before the meeting commence and will only be allowed to attend the meeting if the chairperson of the meeting as well as all the other bidders attending the meeting, give permission to do so.
- b) All partners or the leading partner of a Joint Venture must attend the compulsory site or information meeting.

14. Stamp and Other Duties

The successful bidder will be liable for all duties and costs on legal documents resulting in the establishment of a contract and for the surety and retentions.

15. Language of Contract

The contract documents will be compiled in English and the English versions of all referred documents will be taken as applicable.

16. Procurement Policy

Bids will be evaluated in terms the bid specifications and requirements as well as the 90/10 points system as stipulated in the Preferential Procurement Regulations of 2022 that was promulgated by the Minister of Finance on 04 February 2022 in Government Gazette No 47452 such additional criteria as set out in this bid document.

17. Expenses Incurred in Preparation of Bid

The Phumelela Local Municipality shall not be liable for any expenses incurred in the preparation and submission of the bid.

18. Wrong Information Furnished

Where a contract has been awarded on the strength of the information furnished by the bidder which, after the conclusion of the relevant agreement, is proved to have been incorrect, the Phumelela Local Municipality may, in addition to any other legal remedy it may have, recover from

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



the contractor all costs, losses or damages incurred or sustained by the Municipality as a result of the award of the contract.

19. Validity Period

Bids shall remain valid and available for ninety (90) days calculating from the closing date as advertised for the bid, for acceptance, or non-acceptance by the Municipality. The bidder undertakes not to withdraw, or alter, the bid during this period.

20. Municipal Rates, Taxes and Charges

- a) The bidding company MUST submit their municipal rates and taxes statement, which is not older than three (3) months (90 days) in arrears or VALID lease agreement which is in the name of the company;
 - If the business operates from the different address as per the CIPC document an affidavit certified by the commissioner of oaths must be attached;
 - If the municipal rates and taxes statement is in the Landlord's or Director's name an affidavit certified by the commissioner of oaths must be attached indicating is the Director is the property owner or not;
- b) No contract shall be concluded with any bidder whose municipal rates and taxes and municipal services charges are in arrears.

21. Contact with Municipality after Bid Closure Date

Bidders shall not contact the Phumelela Local Municipality on any matter relating to their bid from the time of the opening of the bid to the time the contract is awarded. Any effort by the firm to influence the Phumelela Local Municipality in the bid evaluation, bid comparison or contract award decisions may result in the rejection of the bid.

22. Extension of Contract

The contract with the successful bidder may be extended should additional funds become available.

23. Past Practices

- a) The bid of any bidder may be rejected if that bidder or any of its directors have abused the municipality's supply chain management system or committed any improper conduct in relation to such system.
- b) The bid of any bidder may be rejected if it is or has been found that that bidder or any of its directors influenced or tried to influence any official or councillor with this or any past bid.
- c) The bid of any bidder may be rejected if it is or has been found that that bidder or any of its directors offered, promised or granted any official or any of his/her close family members, partners or associates any reward, gift, favours, hospitality or any other benefit in any improper way, with this or any past quotation.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**24. Persons in the service of the state**

Any person, having a kinship with persons in the service of the state, including a blood relationship, may make an offer 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 bidder or their authorised representative declare their position in relation to the evaluating / adjudicating authority and/or take an oath declaring his/her interest.

25. Standards

The goods supplied or the services rendered shall conform to the standards mentioned in the bidding document and specifications.

26. Prices

- a) Prices charged by the service provider for goods delivered and services performed under the contract shall not vary from the prices quoted by the service provider in this quotation.
- b) The Bidder will be liable to take out forward cover to barricade him/her against fluctuation of the exchange rate in the event of importing any component, related to the quotation, from a country dealing in currency other than that of South Africa.

27. Termination for default

The Phumelela Local Municipality, without prejudice to any other remedy for breach of contract, by written notice of default sent to the service provider, may terminate this agreement in whole or in part:

- a) If the service provider fails to deliver any or all of the goods within the period(s) specified in the agreement;
- b) If the service provider fails to perform any obligation(s) under the contract; or
- c) If the service provider in the judgment of the Phumelela Local Municipality, has engaged in corrupt or fraudulent practices in competing for or in executing the contract.

In the event that the Phumelela Local Municipality terminates the contract in whole or in part, the Phumelela Local Municipality may procure, upon such terms and in such manner as it deems appropriate, goods, works or services similar to those undelivered, and the service provider shall be liable to the Phumelela Local Municipality for any excess costs for such similar goods, works or services. However, the service provider shall continue performance of the contract to the extent not terminated.

Where the Phumelela Local Municipality terminates the contract in whole or in part, the Phumelela Local Municipality may decide to impose a restriction penalty on the service provider by prohibiting such service provider from doing business with the public sector for a period not exceeding 10 years.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



If the Phumelela Local Municipality intends imposing a restriction on a service provider or any person associated with the service provider, the service provider will be allowed a time period of not more than fourteen (14) days to provide reasons why the envisaged restriction should not be imposed. Should the service provider fail to respond within the stipulated fourteen (14) days the Phumelela Local Municipality may regard the service provider as having no objection and proceed with the restriction.

Any restriction imposed on any person by the Phumelela Local Municipality will, at the discretion of the Phumelela Local Municipality, also be applicable to any other enterprise or any partner, manager, director or other person who wholly or partly exercises or exercised or may exercise control over the enterprise of the first-mentioned person, and with which enterprise or person the first-mentioned person, is or was in the opinion of the Phumelela Local Municipality actively associated.

If a restriction is imposed, the Phumelela Local Municipality must, within five (5) working days of such imposition, furnish the National Treasury, with the following information:

- The name and address of the supplier and / or person restricted by the Phumelela Local Municipality;
- The date of commencement of the restriction;
- The period of restriction; and
- The reasons for the restriction

These details will be loaded in the National Treasury's central database of service provider or persons prohibited from doing business with the public sector.

If a court of law convicts a person of an offence as contemplated in sections 12 or 13 of the Prevention and Combating of Corrupt Activities Act, No. 12 of 2004, the court may also rule that such person's name be endorsed on the Register for Tender Defaulters. When a person's name has been endorsed on the Register, the person will be prohibited from doing business with the public sector for a period not less than five years and not more than 10 years. The National Treasury is empowered to determine the period of restriction and each case will be dealt with on its own merits. According to section 32 of the Act the Register must be open to the public. The Register can be perused on the National Treasury website.

28. Termination for Insolvency

The Phumelela Local Municipality may at any time terminate the contract by giving written notice to the service provider if the service provider becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the service provider, provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to the Phumelela Local Municipality.

29. Settlement of Disputes

- a) If any dispute or difference of any kind whatsoever arises between the Phumelela Local Municipality and the service provider in connection with or arising out of the contract, the

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



parties shall make every effort to resolve amicably such dispute or difference by mutual consultation.

- b) If, after thirty (30) days, the parties have failed to resolve their dispute or difference by such mutual consultation, then either the Phumelela Local Municipality or the service provider may give notice to the other party of their intention to commence with mediation. No mediation in respect of this matter may be commenced unless such notice is given to the other party.
- c) Should it not be possible to settle a dispute by means of mediation, it may be settled in a South African court of law.
- d) Notwithstanding any reference to mediation and/or court proceedings herein, the parties shall continue to perform their respective obligations under the contract unless they otherwise agree; and The Phumelela Local Municipality shall pay the service provider any monies due for goods delivered and/or services rendered according to the prescripts of the contract.

30. Applicable Law

The contract shall be interpreted in accordance with South African laws, unless otherwise specified.

31. Notices

- a) Every written acceptance of a bid and any other notices shall be sent to the service provider concerned by ordinary e-mail to the address furnished in his bid or to the address notified later by him in writing and such e-mail shall be deemed to be proper service of such notice.
- b) The time mentioned in the contract documents for performing any act after such aforesaid notice has been given, shall be reckoned from the date of e-mailing of such notice.

32. Taxes and duties

- a) A service provider shall be entirely responsible for all taxes, duties, license fees, etc., of the contracted goods to the Phumelela Local Municipality.
- b) No contract shall be concluded with any bidder whose tax matters are not in order.

33. Value-added tax (VAT) on invoices

Tax invoices are to comply with the requirements as contained in the Value Added Tax Act, 1991 (Act No 89 of 1991). The content of the invoice must contain information as prescribed by the Act. It is a requirement of this contract that the amount of value-added tax (VAT) must be shown clearly on each invoice. The amended Value Added Tax Act, 1991 (Act No 89 of 1991) requires that a Tax Invoice for supplies in excess of R3,000 should, in addition to the other required information, also disclose the VAT registration number of the recipient, with effect from 1 March 2005. The VAT registration number of the Phumelela Local Municipality is **4000846578**.

34. Construction Industry Development Board (CIDB) (If applicable)

When applicable, the bidder's CIDB registration number as well as CIDB grading must be included with the tender. If no such proof is attached the bid will be disqualified.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**35. Subcontracting**

- a) The Contractor shall not subcontract the whole of the Contract.
- b) Except where otherwise provided by the Contract, the Contractor shall not subcontract any part of the Contract without the prior written consent of the Municipality, which consent shall not be unreasonably withheld.
- c) The contractual relationship between the Contractor and any subcontractors selected by the Contractor in consultation with the Municipality in accordance with the requirements of and a procedure contained within the Scope of Work, shall be the same as if the Contractor had appointed the subcontractor in terms of paragraph (b) above.
- d) Any consent granted in accordance with paragraph (b) or appointment of a subcontractor in accordance with paragraph (c) shall not imply a contract between the Municipality and the subcontractor, or a responsibility or liability on the part of the Municipality to the subcontractor and shall not relieve the Contractor from any liability or obligation under the Contract and he shall be liable for the acts, defaults and neglects of any subcontractor, his agents or employees as fully as if they were the acts, defaults or neglects of the Contractor, his agents or employees.
- e) The Contractor shall not be required to obtain such consent for –
 - (i) the provision of labour, or
 - (ii) the purchase of materials which are in accordance with the Contract, or
 - (iii) the purchase or hire of Construction Equipment.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



EVALUATION OF BIDS BASED ON FUNCTIONALITY AS A CRITERION

Bids invited on the basis of functionality as a criterion must be evaluated in two stages - first functionality must be assessed and then in accordance with the 80/20 or 90/10 preference point systems prescribed in Preferential Procurement Regulations 5 and 6. The evaluation must be done as follows:

10.1. First stage - Evaluation of functionality

- 10.1.1. Bids must be evaluated in terms of the evaluation criteria embodied in the bid documents. The amendment of evaluation criteria, weights, applicable values and/or the minimum qualifying score for functionality after the closure of bids is not allowed as this may jeopardise the fairness of the process.
- 10.1.2. A bid will be considered further if it achieves the prescribed minimum qualifying score for functionality.
- 10.1.3. Bids that fail to achieve the minimum qualifying score for functionality must be disqualified.
- 10.1.4. Scoresheets should be prepared and provided to panel members to evaluate the bids.
- 10.1.5. The score sheet should contain all the criteria and the weight for each criterion as well as the values to be applied for evaluation as indicated in the bid documents.
- 10.1.6. Each panel member should after thorough evaluation independently award his / her own value to each individual criterion.
- 10.1.7. Score sheets should be signed by panel members and if necessary, written motivation may be requested from panel members where vast discrepancies in the values awarded for each criterion exist.
- 10.1.8. If the minimum qualifying score for functionality is indicated as a percentage in the bid documents, the percentage scored for functionality may be calculated as follows:
 - a) The value awarded for each criterion should be multiplied by the weight for the relevant criterion to obtain the score for the various criteria;
 - b) The scores for each criterion should be added to obtain the total score; and
 - c) The following formula should be used to convert the total score to percentage for functionality:

$$Ps = \frac{So}{Ms} \times 100$$

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



where:

Ps = percentage scored for functionality by bid under consideration

So = total score of bid under consideration

Ms = maximum possible score

- 10.1.9. The percentage of each panel member should be added and divided by the number of panel members to establish the average percentage obtained by each bidder for functionality.

10.2. Second stage - Evaluation in terms of the 80/20 or 90/10 preference point systems

- 10.2.1. Only bids that achieve the minimum qualifying score / percentage for functionality must be evaluated further in accordance with the 80/20 or 90/10 preference point systems prescribed in Preferential Procurement Regulations 5 and 6.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



PHUMELELA LOCAL MUNICIPALITY

BID NUMBER : PLMT 24-25/01

**APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT
OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS**

THE TENDER: PART T2

PART 2 (OF 2): RETURNABLE DOCUMENTS

CONTENTS

T2.1	RETURNABLE DOCUMENTS
T2.2	RETURNABLE SCHEDULES AND FORMS
T2.3	CHECKLIST

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



T2.1: RETURNABLE DOCUMENTS

Documents Required for Bid Evaluation Purposes

- Certificate of Contractor Registration issued by the Construction Industry Development Board (CIDB)
- Valid Tax Compliance Status
- Copy of Company Registration Certificate
- Proof of registration on the Central Supplier Database (CSD)
- Valid BBBEE verification certificate or sworn affidavit
- Copy of company profile with clear references
- Valid letter of good standing (COIDA)
- Municipal rates and taxes information
- Original bank rating certificate
- CV's with qualification of all supervisory and safety personnel
- Completion Certificates for contracts of works of a similar nature, successfully completed
- Project Execution Plan
- Three (3) years recent (from 2021 to current) Audited Financial Statements, signed by registered accountant and approved by directors

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



T2.2: RETURNABLE SCHEDULES AND FORMS

Returnable Schedules for Bid Evaluation Purposes

- Record of Addenda to Tender Documents
- Tenderer's Banking Details
- Works Previously Executed
- Present Commitments
- Supervisory and Safety Personnel
- Labour Utilisation
- Compliance with OHSA (Act 85 of 1993)
- Health and Safety budget breakdown
- Plant and Equipment
- Schedule of Proposed Subcontractors (if any)
- Authority of Signatory
- Prospective tender's registration form/Change of registration form
- Joint-Venture Agreement
- Affidavit
- Proposed amendments and qualifications
- Municipal Rates and Taxes form
- MBD 1 – Invitation to BID
- MBD 4 - Declaration of Interest
- MDB 5 - Declaration for procurement above R10,0m (excluding VAT)
- MBD 6.1 - Preference Points Claim form in terms of the Preferential Procurement Regulations, 2022
- MBD 8 - Declaration of Bidder's past Supply Chain Management Practices
- MBD 9 – Certificate of independent BID determination

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



RECORD OF ADDENDA TO TENDER DOCUMENT

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

Date

Name

Position

Enterprise name

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



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. Failure to provide the required letter with the tender submission may render the tenderers offer unresponsive.
2. The tenderers banking details as they appear below shall be completed.
3. In the event that 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.

I/We furnish the following information:

- a) Name of Bank:
- b) Branch of Bank
- c) Town/city/suburb where bank is situated.....
- d) Contact Person at the Bank:
- e) Telephone number of Bank: Code: Number:
- f) Account Number:
- g) Bank rating (include confirmation from bank or financial institution):.....
.....

I/We hereby authorise the Employer to approach the above Bank for a reference.

SIGNED ON BEHALF OF THE TENDERER:.....

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



WORKS PREVIOUSLY EXECUTED

The following is a statement of major works successfully executed by myself / ourselves since 1 January 2017 (for the past 6 years):

Client	Contact Details	Nature of Works	Value of Works	Duration and Completion Date

Failure to submit the required information shall signify that the tenderer information is incomplete.

Signature of Tenderer: _____

Date: _____

State firm, contact person and telephone number

Please attach a detailed list of Projects / Works previously done. Completion certificates to be included in returnable documentation. Value of works is to be included on completion certificates.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PRESENT COMMITMENTS**

Client	Contact Details	Nature of Works	Value of Works	Duration and Completion Date

Signature of Tenderer: _____

Date: _____

* State firm, contact person and telephone number

Please attach detailed present commitments exceeds 5 (Five)

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



SUPERVISORY AND SAFETY PERSONNEL

PREVIOUS EXPERIENCE ON WORKS OF A SIMILAR NATURE DURING THE LAST TEN YEARS

Name	% Time on Site	Position (Current)	Service (Years)	Name of Project And year executed	Value of Works	Position Occupied
Contracts Manager						
Mechanical Specialist						
Electrical Specialist						
Contractor's Site Agent						
Construction Health and Safety Officer						

Tenderers shall indicate the percentage of working time these persons will be engaged on site. Tenderers are required to provide copies of curriculum vitae's with qualification of all supervisory and safety personnel listed in table above.

SIGNATURE OF TENDERER: _____

DATE: _____

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



LABOUR UTILISATION

Labour Categories - Definitions

NOTE: These definitions serve as a guideline to complete the following table and will in no respect alter the Project Specifications or Standardised Specifications.

1. General Foreman/Foreman

An employee who gives out work to and directly co-ordinates and supervises employees. His/her duties encompass any one or more of the following activities:

- (a) Supervision
- (b) Maintaining discipline
- (c) Ensuring safety on the workplace
- (d) Being responsible to the Contractor for efficiency and production for his/her portion of the works
- (e) Performing skilled work, whether in an instructional capacity or otherwise.

2. Charge hand

An employee engaged in any one or more of the following activities:

- (a) Being primarily employed in a supervisory capacity, but who may also be doing the work of an artisan
- (b) Giving out work to other employees under his/her control and supervision
- (c) Ensuring safety on the workplace
- (d) Maintaining discipline
- (e) Being directly responsible to a general foreman or foreman or the Contractor or the Contractor's representative for efficiency and production for his/her portion of the works.

3. Artisan

An employee who has successfully completed all prescribed courses at a practical institutional training centre for a particular trade and who has successfully completed the on-site period of training as prescribed and who has successfully passed the prescribed trade tests.

4. Team Leader

An employee engaged in any one or more of the following activities:

- (a) Being employed in a supervisory capacity, but who may also be doing the work of a skilled person
- (b) Giving out work to other employees under his control and supervision

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- (c) Maintaining discipline
- (d) Being directly responsible to a Charge hand or a foreman or a general foreman or the employer's authorised representative for efficiency and production for his portion of the works.

5. Skilled Employee

An employee engaged in an ancillary trade or an assistant artisan.

6. Semi-Skilled Employee

An employee with any specified skills, an apprentice or a trainee-artisan.

7. Unskilled Employee

An employee engaged on any task or operation not specified above.

8. Imported Employee

Personnel permanently employed by Contractor.

9. Local Employee

Temporary workforce employed through Labour Desk or Ward Councillors.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**MAN DAYS**

Categories	No. of Man Days	
	Imported	Local
1. Contracts Manager		
2. Site Agent		
3. Foreman/Supervisors (specify type)		
3.1		
3.2		
3.3		
4. Safety Inspectors (specify type)		
4.1		
4.2		
5. Charge hands		
6. Artisans		
7. Operators/Drivers		
8. Clerks/Storeman		
9. Team Leader		
10. Skilled Labour		
11. Semi-skilled Labour		
12. Unskilled Labour		

SIGNATURE OF TENDERER:

DATE:

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**COMPLIANCE WITH OHSA (ACT 85 OF 1993)**

Tenderers are required to satisfy the Employer and the Employer's Agent as to their ability and available resources to comply with the above by answering the following questions and providing the relevant information required below.

1. Is the Contractor familiar with the OHSA (ACT 85 OF 1993) and its Regulations? YES / NO
2. Who will prepare the Contractors Health and Safety Plan? (Provide a copy of the person/s curriculum vitae/s or company profile).
.....
3. Does the Contractor have a health and safety policy? (If yes, provide a copy). YES / NO
How is this policy communicated to all employees?
.....
4. Does the Contractor keep records of safety aspects of each construction site? YES / NO
If yes, what records are kept?
.....
5. Does the Contractor conduct monthly safety meetings? If yes, who is the chairperson of the meeting, and who attends these meetings? YES / NO
.....
6. Does the Contractor have a safety officer in his employment, responsible for the overall safety of his company? YES / NO
If yes, please explain his duties and provide a copy of his CV.
.....
.....
7. Does the Contractor have trained first aid employees? If yes, indicate who. YES / NO
.....
8. Does the Contractor have a safety induction training programme in place? YES / NO
(If yes, provide a copy).

SIGNATURE OF TENDERER: DATE:

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



SCHEDULE OF CONSTRUCTION PLANT / 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 PLANT / EQUIPMENT IMMEDIATELY AVAILABLE

DESCRIPTION, SIZE, CAPACITY	NUMBER

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**CONSTRUCTION PLANT / EQUIPMENT ON ORDER**

(State details of arrangements made, with delivery dates)

DESCRIPTION, SIZE, CAPACITY	NUMBER

CONSTRUCTION PLANT / 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).

Note: Please provide a proof of plant ownership or a signed rental agreement. Failure to comply will indicate that the tenderer is non-responsive.

SIGNATURE OF TENDERER: DATE:

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**SCHEDULE OF PROPOSED SUBCONTRACTORS (IF ANY)**

We notify you that it is our intention to employ the following Subcontractors for work in this contract.

If we are awarded a contract, we agree that this notification does not change the requirement for us to submit the names of proposed Subcontractors in accordance with requirements in the contract for such appointments. If there are no such requirements in the contract, then your written acceptance of this list shall be binding between us.

No.	Name and address of proposed Subcontractor	Nature and extent of work	Previous experience with Subcontractor
1.			
2.			
3.			

Signed

Date

Name

Position

Tenderer

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



AUTHORITY OF SIGNATORY

I/we herewith certify that this tender is submitted by : *(Mark applicable block)*

a)	a company, and attach hereto a certified copy of the required resolution of the Board of Directors	☐
b)	a partnership, and attach hereto a certified copy of the required resolution by all partners	☐
c)	a close corporation, and attach hereto a certified copy of the required resolution of the Board of Officials	☐
d)	a one-man business, and attach hereto certified proof that I am the sole owner of the business submitting this tender	☐
e)	a joint venture, and attach hereto	☐
- a notarially certified copy of the original document under which the joint venture was constituted; and
 - certified authorisation by the participating members of the undersigned to submit tenders and conclude contracts on behalf of the joint venture

SIGNATURE OF TENDERER: DATE:

Contractor
Witness 1
Witness 2
Employer
Witness 1
Witness 2



PROSPECTIVE TENDERER'S REGISTRATION FORM / CHANGE OF REGISTRATION FORM

The Main Tenderers, Subcontractors or Joining Entities listed in Table 1 of the Schedule No. 7 must complete this form despite the fact that they must register as a Registered Tenderer separately.

All Tenderers (Main Contractor, Subcontractors or Joining Entities) intending to tender, or a Registered Tenderer whose registration information has changed in the mean-time, must complete this form and submit it to the client not later than 7 days before the closing of the relevant tender.

*** Complete in full (indicate N/A where not available or applicable) and indicate if the information is submitted for the first time (F), it is unchanged (U) or has changed (C) since the previous submission.**

- Name of Business (or person, in case of goods/services provided by a person):

..... ()*

- Official physical address of business, e-mail, telephone and fax numbers:

- Address: ()*

- E-mail: ()*

- Telephone: ()*

- Fax: ()*

- Electricity account no. if a local business: ()*

- Type of business (Company, cc, etc): ()*

- Main business activity (Stationary Dealer, Building Contractor, etc):

..... ()*

- Estimated annual turnover (to remain confidential): R..... ()*

- Full name of controlling shareholder if not a one-man business (to remain confidential):

..... ()*

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Tender forms pertaining to Preferential Procurement JOINT VENTURE FORM

The following legal business entities agree to deliver the services and/or goods as required under this Contract as a Joint Venture as follows:

Name and Addresses of Joint Venture:

.....

.....

Consisting of the following businesses (Joining Entities)

NAME JOINING ENTITY	TAX NO.	PROPORTIONAL PAYMENT THAT WILL BE RECEIVED UNDER THIS CONTRACT
.....		 %
.....		 %
.....		 %
.....		 %

The above-mentioned Joint venture will execute the Contract under the management of (Full Name)

.....

Who is an employee of (Name of Joining Entity)

.....;

And in accordance with any further agreements as attached to this document, titled

.....

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



and dated

(if applicable). Bank guarantees and retention money (where required) will be provided or paid by (Name of Joining Entity)

.....
who will be responsible for the fulfilment of the retention obligations (where required) asset out in the Contract Document.

Signed by the duly authorized representatives of the above-mentioned Joint Entities:

JOINING ENTITY AND POSITION	FULL NAME (Position)	SIGNATURE	DATE
.....			
.....			
.....			
.....			
.....			

WITNESSES

1.

.....

2.

.....

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**AFFIDAVIT**

Affidavit to be completed by every member of a company, closed corporation, trust, partnership or other business entity, claiming preference points regarding their HDI-status:

1. I, the undersigned, hereby
(Full name and surname)

Certify that I am a
of the tenderer.

(Member, Director, Partner, Owner)

2. I furthermore certify that I personally hold% (percent) equity shares in the above mentioned business venture and are actively involved in the management and control of the business.

Signed at on this day of
.....20.....

.....
Signature

I certify that the deponent has acknowledge that he/she knows and understands the contents of this declaration.

This declaration has been sworn / affirmed before me at

.....

On this day of 20.....

.....

STAMP:

COMMISSIONER OF OATHS

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



I, THE UNDERSIGNED, ACTING IN MY
CAPACITY AS THE COMPANY/CORPORATION/BUSINESS VENTURE:

.....
Hereby gives Phumelela Local Municipality and its delegates the right to inspect any documents in our
possession pertaining to the verification of information reflecting the equity held in our company /
corporation / business venture.

Signed at on this day

of 20.....

.....

Signature

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



PROPOSED AMENDMENTS AND QUALIFICATIONS

The Tenderer should record any deviations or qualifications he may wish to make to the tender documents in this Returnable Schedule. Alternatively, a tenderer may state such deviations and qualifications in a covering letter to his tender and reference such letter in this schedule.

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

Page	Clause or item	Proposal

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**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 4: 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 5: Particulars of companies and close corporations

Company registration number

Close corporation number

Tax reference number

Section 6: Record in the service of the state

Indicate by marking the relevant boxes with a cross, if any sole proprietor, partner in a partnership or director, manager, principal shareholder or stakeholder in a company or close corporation is currently or has been within the last 12 months in the service of any of the following:

☐ a member of any municipal council	☐ an employee of any provincial department,
☐ a member of any provincial legislature	national or provincial public entity or
☐ a member of the National Assembly or the	constitutional institution within the meaning of
National Council of Province	the Public Finance Management Act, 1999
☐ a member of the board of directors of any	(Act 1 of 1999)
municipal entity	☐ a member of an accounting authority of any
☐ an official of any municipality or municipal	national or provincial public entity
entity	☐ an employee of Parliament or a provincial
	legislature

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



If any of the above boxes are marked, disclose the following:

Name of sole proprietor, partner, director, manager, principal shareholder or stakeholder	Name of institution, public office, board or organ of state and position held	Status of service (tick appropriate column)	
		Current	Within last 12 months

*insert separate page if necessary

Section 7: Record of spouses, children and parents in the service of the state

Indicate by marking the relevant boxes with a cross, if any spouse, child or parent of a sole proprietor, partner in a partnership or director, manager, principal shareholder or stakeholder in a company or close corporation is currently or has been within the last 12 months been in the service of any of the following:

☐ a member of any municipal council	☐ an employee of any provincial department,
☐ a member of any provincial legislature	national or provincial public entity or
☐ a member of the National Assembly or the National Council of Province	constitutional institution within the meaning of
☐ a member of the board of directors of any municipal entity	the Public Finance Management Act, 1999 (Act 1 of 1999)
☐ an official of any municipality or municipal entity	☐ a member of an accounting authority of any national or provincial public entity
	☐ an employee of Parliament or a provincial legislature

Name of spouse, child or parent	Name of institution, public office, board or organ of state and position held	Status of service (tick appropriate column)	
		Current	Within last 12 months

* insert separate page if necessary

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



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

Date

Signed

Name

Position

Enterprise
name

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**MUNICIPAL RATES AND TAXES FORM****PART A (TO BE COMPLETED BY RELEVANT MUNICIPALITY)**

Name of the Municipality:

Property Physical Address:

Company Registration Name:

Official's Name:

Municipality Stamp Here

Signature: _____ Contact Details: _____ Date: _____

Please tick whether in arrears or up-to-date

Rates and taxes: Up-to-date / in arrears for more than 3 months: R _____

PART B (TO BE COMPLETED BY THE LANDLORD)

Name of the Landlord:

Property Physical address:

Company Registration Name:

Landlord Signature:

Date: _____

Landlord's business stamp here

Or an Affidavit from SAPS

(in the event the landlord does not have

A business stamp

Please tick whether up-to-date or in arrears

Rental: Up-to-date / in arrears for more than 3 months: R _____ Municipal

services: Up-to-date / in arrears for more than 3 months: R _____

NB: IF YOU FAIL TO COMPLETE THIS FORM, PLEASE REGARD YOUR BID AS NON RESPONSIVE!

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



MBD 1

**PART A
INVITATION TO BID**

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE PHUMELELA LOCAL MUNICIPALITY

BID NUMBER:	PLMT 24-25/01	CLOSING DATE:	08 November 2024	CLOSING TIME:	12H00

DESCRIPTION	APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS

THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FILL IN AND SIGN A WRITTEN CONTRACT FORM (MBD7).

BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX
SITUATED AT (STREET ADDRESS)

PHUMELELA MUNICIPAL OFFICES

52 KUHN STREET

VREDE

9835

SUPPLIER INFORMATION

NAME OF BIDDER					
POSTAL ADDRESS					
STREET ADDRESS					
TELEPHONE NUMBER	CODE		NUMBER		
CELLPHONE NUMBER					
FACSIMILE NUMBER	CODE		NUMBER		
E-MAIL ADDRESS					
VAT REGISTRATION NUMBER					
TAX COMPLIANCE STATUS	TCS PIN:		OR	CSD No:	
B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE [TICK APPLICABLE BOX]	☐ Yes ☐ No		B-BBEE STATUS LEVEL SWORN AFFIDAVIT	☐ Yes ☐ No	

[A B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE/ SWORN AFFIDAVIT (FOR EMES & QSEs) MUST BE SUBMITTED IN ORDER TO QUALIFY FOR PREFERENCE POINTS FOR B-BBEE]

ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES /WORKS OFFERED?	☐ Yes ☐ No [IF YES ENCLOSE PROOF]	ARE YOU A FOREIGN BASED SUPPLIER FOR THE GOODS /SERVICES /WORKS OFFERED?	☐ Yes ☐ No [IF YES, ANSWER PART B:3]

TOTAL NUMBER OF ITEMS OFFERED		TOTAL BID PRICE	R

SIGNATURE OF BIDDER		DATE	

CAPACITY UNDER WHICH THIS BID IS SIGNED

BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO:

DEPARTMENT	FINANCE: SCM	CONTACT PERSON	
CONTACT PERSON		TELEPHONE NUMBER	
TELEPHONE NUMBER		FACSIMILE NUMBER	
FACSIMILE NUMBER		E-MAIL ADDRESS	
E-MAIL ADDRESS			

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



MBD 1

PART B 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 RE-TYPED) OR ONLINE**
- 1.3. THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT AND THE PREFERENTIAL PROCUREMENT REGULATIONS, 2017, 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 TAXPAYER'S 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 PART B:3.
- 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.**

SIGNATURE OF BIDDER:

CAPACITY UNDER WHICH THIS BID IS SIGNED:

DATE:

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



MBD 4

DECLARATION OF INTEREST

1. No bid will be accepted from persons in the service of the state*.
2. 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 bidder 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 bidder or his or her representative:.....

3.2 Identity Number:

3.3 Position occupied in the Company (director, trustee, shareholder²):.....

3.4 Company 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.

.....

'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) a member of the accounting authority of any national or provincial public entity; or

(f) an employee of Parliament or a provincial legislature.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



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.

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 bidder 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.

.....
.....

3.14 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:

.....
.....

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



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

Full Name	Identity Number	State Employee Number	Personal Income Tax Number

CERTIFICATION

I, THE UNDERSIGNED (NAME)

CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS CORRECT.

I ACCEPT THAT THE MUNICIPALITY MAY ACT AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE (which also includes cancellation of the bid).

.....
Name of Bidder (Company)

.....
Position

.....
Signature

.....
Date

.....
Contractor

.....
Witness 1

.....
Witness 2

.....
Employer

.....
Witness 1

.....
Witness 2



MBD 5

DECLARATION FOR PROCUREMENT ABOVE R10 MILLION (ALL APPLICABLE TAXES INCLUDED)

For all procurement expected to exceed R10 million (VAT 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 a municipality 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 a municipality 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

.....
.....

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



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.

.....
Signature

.....
Date

.....
Position

.....
Name of Bidder

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**MBD 6.1**

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

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

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

(delete whichever is not applicable for this tender).

- a) The applicable preference point system for this tender is the 90/10 preference point system.
- b) The applicable preference point system for this tender is the 80/20 preference point system.
- c) Either the 90/10 or 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

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



- 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).

3. FORMULAE FOR PROCUREMENT OF GOODS AND SERVICES

3.1. POINTS AWARDED FOR PRICE

3.1.1 THE 80/20 OR 90/10 PREFERENCE POINT SYSTEMS

A maximum of 80 or 90 points is allocated for price on the following basis:

$$Ps = 80 \left(1 - \frac{Pt - Pmin}{Pmin} \right) \text{ or } Ps = 90 \left(1 - \frac{Pt - Pmin}{Pmin} \right)$$

Where

Ps = Points scored for price of tender under consideration
 Pt = Price of tender under consideration
 Pmin = Price of lowest acceptable tender

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

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



3.2.1. POINTS AWARDED FOR PRICE

A maximum of 80 or 90 points is allocated for price on the following basis:

$$P_S = 80 \left(1 + \frac{Pt - P_{max}}{P_{max}} \right) \text{ or } P_S = 90 \left(1 + \frac{Pt - P_{max}}{P_{max}} \right)$$

Where

Ps = Points scored for price of tender under consideration

Pt = Price of tender under consideration

P_{max} = Price of highest acceptable tender

4. POINTS AWARDED FOR SPECIFIC GOALS

- 4.1. In terms of Regulation 4(2); 5(2); 6(2) and 7(2) of the Preferential Procurement Regulations, preference points must be awarded for specific goals stated in the tender. For the purposes of this tender the tenderer will be allocated points based on the goals stated in table 1 below as may be supported by proof/ documentation stated in the conditions of this tender:
- 4.2. In cases where organs of state intend to use Regulation 3(2) of the Regulations, which states that, if it is unclear whether the 80/20 or 90/10 preference point system applies, an organ of state must, in the tender documents, stipulate in the case of—
- (a) an invitation for tender for income-generating contracts, that either the 80/20 or 90/10 preference point system will apply and that the highest acceptable tender will be used to determine the applicable preference point system; or
 - (b) any other invitation for tender, that either the 80/20 or 90/10 preference point system will apply and that the lowest acceptable tender will be used to determine the applicable preference point system,
- then the organ of state must indicate the points allocated for specific goals for both the 90/10 and 80/20 preference point system.

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.)

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Allocation of Specific Goals points for Procurements and Income-Generating transactions below R50 000 000 (80/20 Preferential Points System) and above R50 000 000 (90/10 Preferential Points System).

50% (10 out of 20 and 5 out of 10) of Specific goals points, will be allocated based on a geographical area of a supplier as follows,

<u>Specific goal</u>	<u>Applicable weight [80:20]</u>	<u>Applicable weight [90:10]</u>	<u>Evidence to be submitted by the supplier to substantiate the points claimed/allocated per specific goal (NB: Any of the evidence indicated below per specific goal should be regarded as sufficient)</u>
EME or QSE	6	3	- Sworn affidavit signed by the EME or QSE representative and attested by a Commissioner of Oaths - A certified copy of a BB-BEE certificate issued by the verification agency accredited by SANAS - Proof of B-BBEE issued by DTIC
Woman	4	2	- RSA identity document - Valid RSA driver's license issued by the relevant authority
Youth	4	2	- RSA identity document - Valid RSA driver's license issued by the relevant authority (NB: Youth is defined as any south African citizen with the age between 18 and 35 years)
People with disability	2	1	Sworn affidavit signed by the company representative and attested by the Commission of oaths
Free state based company (NB : the institutions must ensure that this specific goal is aligned to the district they are situated in e.g suppliers situated in Thabo Mofutsanyane District	4	2	- Municipal Account - Lease agreement - Title deeds - Permission to occupy land signed by the traditional authority A letter of confirmation of the address signed by the ward councilor

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



- 4.3. 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:

.....
.....
.....

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



MBD 8

DECLARATION OF BIDDER'S PAST SUPPLY CHAIN MANAGEMENT PRACTICES

- 1 This Municipal Bidding Document must form part of all bids invited.
- 2 It serves as a declaration to be used by municipalities and municipal entities in ensuring that when goods and services are being procured, all reasonable steps are taken to combat the abuse of the supply chain management system.
- 3 The bid of any bidder may be rejected if that bidder, or any of its directors 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).
- 4 In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.

Item	Question	Yes	No
4.1	Is the bidder or any of its directors listed on the National Treasury's database 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 National Treasury after the <i>audi alteram partem</i> rule was applied).	Yes ☐	No ☐
4.1.1	If so, furnish particulars:		
4.2	Is the bidder 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 (No 12 of 2004)? (To access this Register enter the National Treasury's website, www.treasury.gov.za, click on the icon "Register for Tender Defaulters" or submit your written request for a hard copy of the Register to facsimile number (012) 3265445).	Yes ☐	No ☐
4.2.1	If so, furnish particulars:		

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



4.3	Was the bidder 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 ☐
4.3.1	If so, furnish particulars:		
Item	Question	Yes	No
4.4	Does the bidder 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 ☐
4.4.1	If so, furnish particulars:		
4.5	Was any contract between the bidder 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 ☐
4.7.1	If so, furnish particulars:		

CERTIFICATION

I, THE UNDERSIGNED (FULL NAME)

CERTIFY THAT THE INFORMATION FURNISHED ON THIS
DECLARATION FORM TRUE AND CORRECT.

I ACCEPT THAT, IN ADDITION TO CANCELLATION OF A CONTRACT, ACTION MAY BE
TAKEN AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE.

.....

Signature

.....

Date

.....

Position

.....

Name of Bidder

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**MBD 9****CERTIFICATE OF INDEPENDENT BID DETERMINATION**

1. This Municipal Bidding Document (MBD) must form part of all bids¹ invited.
2. section 4 (1) (b) (iii) of the Competition Act No. 89 of 1998, as amended, prohibits an agreement between, or concerted practice by, firms, or a decision by an association of firms, if it is between parties in a horizontal relationship and if it involves collusive bidding (or bid rigging).² Collusive bidding is a *pe se* prohibition meaning that it cannot be justified under any grounds.
3. Municipal Supply Regulation 38 (1) prescribes that a supply chain management policy must provide measures for the combating of abuse of the supply chain management system, and must enable the accounting officer, among others, to:
 - a. take all reasonable steps to prevent such abuse;
 - b. reject the bid of any bidder if that bidder or any of its directors has abused the supply chain management system of the municipality or municipal entity or has committed any improper conduct in relation to such system; and
 - c. cancel a contract awarded to a person if the person committed any corrupt or fraudulent act during the bidding process or the execution of the contract.
4. This MBD serves as a certificate of declaration that would be used by institutions to ensure that, when bids are considered, reasonable steps are taken to prevent any form of bid-rigging.
5. In order to give effect to the above, the attached Certificate of Bid Determination (MBD 9) must be completed and submitted with the bid:

¹ Includes price quotations, advertised competitive bids, limited bids and proposals.

² Bid rigging (or collusive bidding) occurs when businesses, that would otherwise be expected to compete, secretly conspire to raise prices or lower the quality of goods and / or services for purchasers who wish to acquire goods and / or services through a bidding process. Bid rigging is, therefore, an agreement between competitors not to compete.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



MBD 9

CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying bid:

(Bid Number and Description)

in response to the invitation for the bid made by:

(Name of Municipality / Municipal Entity)

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 Bidder)

1. I have read and I understand the contents of this Certificate;
2. I understand that the accompanying bid will be disqualified if this Certificate is found not to be true and complete in every respect;
3. I am authorized by the bidder to sign this Certificate, and to submit the accompanying bid, on behalf of the bidder;
4. Each person whose signature appears on the accompanying bid has been authorized by the bidder to determine the terms of, and to sign, the bid, on behalf of the bidder;
5. For the purposes of this Certificate and the accompanying bid, I understand that the word "competitor" shall include any individual or organization, other than the bidder, whether or not affiliated with the bidder, who:
 - (a) has been requested to submit a bid in response to this bid invitation;
 - (b) could potentially submit a bid in response to this bid invitation, based on their qualifications, abilities or experience; and
 - (c) provides the same goods and services as the bidder and/or is in the same line of business as the bidder
6. The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium³ will not be construed as collusive bidding.
7. In particular, without limiting the generality of paragraphs 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)

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**MBD 9**

- (c) methods, factors or formulas used to calculate prices;
 - (d) the intention or decision to submit or not to submit, a bid;
 - (e) the submission of a bid which does not meet the specifications and conditions of the bid; or
 - (f) bidding with the intention not to win the bid.
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 bid invitation relates.
9. The terms of the accompanying bid have not been, and will not be, disclosed by the bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.

³ 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.

10. I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to bids and contracts, bids 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.

.....

Signature

.....

Date

.....

Position

.....

Name of Bidder

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



T2.3: Checklist

The following information **MUST** be completed in full and/or attached to the tender document:

Documents required only for bid evaluation purposes	Tenderer	Evaluator
Certificate of Contractor Registration issued by the Construction Industry Development Board (CIDB)	Tick if submitted	Tick if accepted
An original valid Tax Clearance Certificate/ Tax Compliance Status	Tick if submitted	Tick if accepted
Certified copy of Company Registration Certificate	Tick if submitted	Tick if accepted
Proof of registration on the Central Supplier Database (CSD)	Tick if submitted	Tick if accepted
Valid BBBEE verification certificate.	Tick if submitted	Tick if accepted
Copy of company profile with clear references	Tick if submitted	Tick if accepted
Valid letter of good standing	Tick if submitted	Tick if accepted
Certified copy of Municipal Rates & Taxes	Tick if submitted	Tick if accepted
Copies of CV's with qualification of all supervisory and safety personnel	Tick if submitted	Tick if accepted
Completion Certificates for contracts of works of a similar nature, successfully completed	Tick if submitted	Tick if accepted
Original bank rating certificate	Tick if submitted	Tick if accepted
Project Execution Plan	Tick if submitted	Tick if accepted
Three (3) years recent (from 2021 to current) Audited Financial Statement, signed by registered accountant and approved by directors	Tick if submitted	Tick if accepted

Returnable schedules for bid evaluation purposes	Tenderer	Evaluator
Record of Addenda to tender document	Tick if submitted	Tick if accepted
Tenderer's banking details	Tick if submitted	Tick if accepted
Works Previously Executed	Tick if submitted	Tick if accepted
Present Commitments	Tick if submitted	Tick if accepted
Supervisory, Design and Safety Personnel	Tick if submitted	Tick if accepted
Project Execution Plan	Tick if submitted	Tick if accepted

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Labour Utilisation	Tick if submitted	Tick if accepted
Compliance with OHSA	Tick if submitted	Tick if accepted
Health and Safety budget breakdown	Tick if submitted	Tick if accepted
Plant and Equipment	Tick if submitted	Tick if accepted
Schedule of Proposed Subcontractors (if any)	Tick if submitted	Tick if accepted
Authority of Signatory	Tick if submitted	Tick if accepted
Prospective tender's registration form/Change of registration form	Tick if submitted	Tick if accepted
Joint-Venture Agreement	Tick if submitted	Tick if accepted
Affidavit	Tick if submitted	Tick if accepted
Proposed amendments and qualifications	Tick if submitted	Tick if accepted
Municipal Rates and Taxes Form	Tick if submitted	Tick if accepted
MBD 1 – Invitation to BID	Tick if submitted	Tick if accepted
MBD 4 - Declaration of Interest	Tick if submitted	Tick if accepted
MBD 5 - Declaration for procurement above R10,0m (excluding VAT)	Tick if submitted	Tick if accepted
MBD 6.1 - Preference Points Claim form in terms of the Preferential Procurement Regulations, 2022	Tick if submitted	Tick if accepted
MBD 8 - Declaration of Bidder's past Supply Chain Management Practices	Tick if submitted	Tick if accepted
MBD 9 – Certificate of independent BID determination	Tick if submitted	Tick if accepted

Documents that will be incorporated into the contract	Tenderer	Evaluator
C1.1 Form of Offer and Acceptance	Tick if submitted	Tick if accepted
C1.2 Contract Data (Part 2)	Tick if submitted	Tick if accepted
C2.2 Bill of Quantities	Tick if submitted	Tick if accepted

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PHUMELELA LOCAL MUNICIPALITY

BID NUMBER : PLMT 24-25/01

**APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT
OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS**

THE CONTRACT: PART C1

PART 1 (OF 5): AGREEMENT AND CONTRACT DATA

CONTENTS

C1.1	Form of Offer and Acceptance
C1.2	Contract Data (Part 1)
C1.3	Contract Data (Part 2)
C1.4	Form of Guarantee (Pro Forma)
C1.5	Occupational Health and Safety Agreement
C1.6	Protection of the Environment Declaration
C1.7	Insurance Broker's Warrantee
C1.8	Contract Employment as Community Liaison Officer

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C1.1: Form of Offer and Acceptance

General Conditions of Contract Works, Third Edition (2015)

A: OFFER

The Employer, identified in the Acceptance signature block, has solicited offers to enter into a contract in respect of the following works:

BID NUMBER: PLMT 24-25/01: APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS

The Tenderer, identified in the Offer signature block below, 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 authorised, 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:

R *(In words)*.....

.....)

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.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



For the Tenderer:

Signature: *(of person authorized to sign the tender)*

Name: *(of signatory in capitals)*:

Capacity: *(of Signatory)*:

Name and Address of organisation:

.....:

.....:

Signature and name of Witness:

Signature:

Name:

Date:

[Failure of a Tenderer to sign this part of the Form of Offer and Acceptance will invalidate the tender]

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**B: ACCEPTANCE**

By signing this part of the 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 as set out in the General and Special Conditions of Contract, and 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 1: Agreements and Contract Data, (Which includes this Agreement)

Part 2: Pricing Data

Part 3: Scope of Works

Part 4: Site Information

and the schedules, forms, drawings and documents or parts thereof, which may be incorporated by reference into Parts 1 to 6 above.

Deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Tender 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 Agreement. 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 other bonds, guarantees, proof of insurance and any other documentation 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.

Notwithstanding anything contained herein, this Agreement comes into effect on the date when the Tenderer receives one fully completed original copy of this document, including the Schedule of Deviations (if any). Unless the Tenderer (now Contractor) within five days of the date of such receipt notifies the Employer in writing of any reason why he cannot accept the contents of this Agreement, this Agreement shall constitute a binding contract between the parties.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



For the Employer:

Signature:

Name: (in capitals)

Capacity:

Name and address of organisation:

.....

Signature and name of witness:

Signature:

Name:

Date:

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C: SCHEDULE OF DEVIATIONS

Notes:

1. The extent of deviations from the tender documents issued by the Employer prior to the tender closing date is limited to those permitted in terms of the Tender Data and the Conditions of Tender.
2. A Tenderer's covering letter will not necessarily 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:

.....

2. **Subject:**

Details:

.....

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



3. **Subject:**

Details:

.....

4. **Subject:**

Details:

.....

5. **Subject:**

Details:

.....

By the duly authorised representatives signing this Schedule of Deviations, 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 Tender Schedules, as well as any confirmation, clarification or change 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.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



For the Tenderer:

Signature:

Name:

Capacity:

Tenderer: **(Name and address of organisation)**.....

.....

Witness :

Signature:

Name:

Date:

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



For the Employer:

Signature:

Name:

Capacity:

Employer: **(Name and address of organisation)**

.....

Witness :

Signature:

Name:

Date:

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C1.2 Contract Data (Part 1)

The General Conditions of Contract for Construction Works, 3rd Edition (2015), published by the South African Institution of Civil Engineering (SAICE), are applicable to this Contract and obtainable from www.saice.org.za.

The General Conditions of Contract are not bound into this document, but are available at the Contractor's expense from the Secretary of the South African Institution of Civil Engineering, Private Bag X200, Halfway House, Midrand, 1685.

PART 1: CONTRACT SPECIFIC DATA PROVIDED BY THE EMPLOYER

The following contract specific data, referring to the General Conditions of Contract for Construction Works, Third Edition, 2015, are applicable to this Contract.

The Contract Data consists of two parts. Part 1 contains information provided by the Employer, while Part 2 contains information to be provided by the Contractor.

Part 1: Data Provided by the Employer

Clause	Contract Data
1.1.1.5	The Commencement Date shall be the date of which the Contractor receives a copy of the signed Form of Offer and Acceptance and schedule of deviations if applicable.
1.1.1.13	The Defect Liability Period is 12 calendar months , measured from the date of the Certificate of Completion.
1.1.1.14	The time for achieving Practical completion, calculated from Commencement Date is as stipulated in the Form and Offer and front Page.
1.1.1.15	The Employer is Phumelela Local Municipality. The Employer's domicilium citandi et executandi (permanent physical address) is: 52 Kuhn Street Vrede 9835 The Employer's Agent means any Director, Associate or Professional Engineer appointed generally or specifically by the management of the firm African Engineering and Construction Solutions (Pty) Ltd to fulfil the functions of the Employer's Agent in terms of the Conditions of Contract. The Employer's Agent is (also referred to as the Engineer): African Engineering and Construction Solutions (Pty) Ltd 3 Kloof Street Bethlehem 9701 Tel No: 058 303 1269 E-mail: tobie@afriangroup.co.za, alternatively hans@afriangroup.co.za Contact person: Mr. TW Bartleman, alternatively Mr. H Temperman

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause	Contract Data
1.1.1.17	Add the following to the clause: Any reference to the term "Engineer's Representative" in this Contract shall mean "Employer's Agent's Representative" and vice versa.
1.1.1.26	The Pricing Strategy is: Re-measurement Contract.
1.2.1.2	The Employer's address for receipt of communications and notices are: Phumelela Local Municipality 52 Kuhn Street Vrede 9835 The addresses and telephone numbers of the Employer's Agent is: African Engineering and Construction Solutions 3 Kloof Street Bethlehem 9701 Tel no.: 058 303 1269
1.3.2	The governing law is the law of the Republic of South Africa.
1.3.3	The language of the Contract and for written communications is English.
1.3.5	Add the following to the clause: The Contract Specific Data, Specifications (other than Standardized Specifications), Bill of Quantities and Drawings are the copyright of African Engineering and Construction Solutions (Pty) Ltd.
3.1.3	The Employer's Agent shall obtain the specific approval of the Employer before executing any of his functions or duties according to the following Clauses of the General Conditions of Contract: Clause 5.12: Extension of Time for Practical Completion Clause 6.3: Variations Clause 6.6.3: Provisional/Expenditure of Contingency Allowance Clause 10.1.5: Unless otherwise provided in the contract, the Employer's Agent shall, within 28 days after the Contractor and the Employer his written and adequately reasoned ruling on the claim (referring specifically to this Clause). The amount thereof, if any, allowed by the Employer's Agent shall be included to the credit of the Contractor in the next payment certificate

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause	Contract Data
3.2.4	A Health and Safety Agent shall be appointed on this contract in terms of the Construction Regulations, 2014, as promulgated in terms of the Occupational Health and Safety Act, 1993. The Principal Contractor shall perform a preliminary assessment of the project-generated H&S plan and submit such to the Health and Safety Officials for legal compliance assessment & verification / approval prior to any works commencing. The duly appointed H&S Officials will be responsible for further monitoring and the auditing of the approved H&S plan for legal compliance.
4.3.1	<u>Add the following</u> to the clause: "With effect from 30 June 2014, the conditions of employment applicable on conventional construction works shall be as set out in the Bargaining Council for Civil Engineering Collective Agreement promulgated in Government Gazettes Numbers 37748 and 37749 dated 20 June 2014. These conditions shall supersede those set out in Section C3.7.4: Employment Conditions, in the event of any conflict Compliance with the National Environmental Management Act (NEMA), Act 107 of 1998. The Basic Conditions of Employment Act of 1997 (Act No 75 of 1997), as per Government Notice R63 of 25 January 2002, shall apply to works described in the Scope of Work as being labour-intensive and which are undertaken by unskilled or semi-skilled workers. The Contractor shall comply with the Occupational Health and Safety Specification prepared by the Employer in terms of the Construction Regulations, 2014, promulgated in terms of Section 43 of the Occupational Health and Safety Act (Act No. 85 of 1993). Without limiting the Contractor's obligations in terms of the Contract, the Contractor shall be in possession of an approved Health and Safety Plan before commencement of the Works or any part thereof."
4.4.4	<u>Replace with the following</u> The Employer may nominate a Sub-Contractor for the contract under all Provisional Sum Items stated in the Bill of Quantities and it is envisaged that they be utilized for the activities as stated.
4.5	<u>Add the following</u> new Sub-Clauses: 4.5.5 On the request of the Contractor, the Employer may, at his sole discretion, provide a support service to the Contractor in the giving of notices and in obtaining requisite consents, permissions and permits. 4.5.6 On the request of the Contractor and certified by the Employer's Agent as payable by the Contractor, the Employer may, in his sole discretion, advance funds to the Contractor in the form of a cheque in favour of the relevant institution or body, to facilitate the Contractor in complying with the provisions of this Clause.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause	Contract Data
	The Contractor shall provide proof to the Employer's Agent of all payments effected by him. The Employer will deduct the sums advanced by the Employer, adjusted in accordance with the Contract Price Adjustment Formula or other rise-and-fall provision applicable to the Contract, from future payment certificates of the Contractor if such sums are payable by the Contractor in the ordinary course of his business. The Employer will not advance funds in respect of cyclic sums payable by the Contractor in the ordinary course of his business.
4.11.3	Add the following to Clause 4.11 "Notwithstanding the wording of this Clause, on request of the Contractor, the Employer may at his sole discretion provide trade-skills training to the Contractor's employees to improve their competency and efficiency commensurate with the requirements of the Works.
5.3.1	The following documentation is required before the Commencement with the Works: a) Health and Safety Plan (Clause 4.3) b) Initial programme (Clause 5.6) c) Security (Clause 6.2) d) Insurance (Clause 8.6) e) Letter of Good Standing f) Quality Assurance Plan
5.3.2	The Contractor is required, within 14 days of the Commencement Date, to submit the documents listed below to the Employer's Agent for his approval. Health and Safety Plan A health and safety plan in terms of Clause 7(1) of the Construction Regulations (February 2014). Initial Programme An Initial Programme of work in terms of Clause 5.6. Security A guarantee from an Insurance Company to be jointly and severally bound with the for an amount equal to ten per cent (10%) of the Contract Price. The of the Guarantee shall be identical to the pro forma currently in use by the on civil Engineering contracts. Insurance Submit copies of receipts of registration, or payment for the premiums for the following as required by the new Clause 8.6 in this Contract Data.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause	Contract Data
	a) Proof of registration with the Department of Labour as an employer, in terms of the Compensation for Occupational Injuries and Diseases Act 1993, as amended b) Common Law Liability Insurance for the duration of the Contract Period and with a minimum Limit of Indemnity of not less than R1 000 000 for any one accident; c) Insurance on an All-Risks basis for construction plant, equipment and other things (except those intended to incorporation into the works) brought onto the site to the full value of such construction plant, equipment and other things; d) Motor Vehicle Liability Insurance, comprising a minimum of Balance of Third-Party motor risks, including Passenger Liability, subject to a minimum limit of R2,5 million; e) Signed subcontract agreements with EME subcontractors including full details of work package agreed on for each EME. Quality Assurance Plan The contractor shall implement a quality assurance system in accordance with ISO 9001 and appoint a quality manager who shall ensure that members of the contractor's staff comply with the requirements of the quality system. The quality system and the methods used to implement it shall be described in a quality plan produced by the contractor. The quality manager shall be resident on site full time. No construction activities shall take place on site before the Employer's Agent approves the Quality Assurance Plan.
5.4.2	Access to and possession of the Site shall not be exclusive to the Contractor, but as set out in the Site Information. 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 purposes of the Works.
5.8.1	Delete the words "between sunset and sunrise" in the first line and replace with "outside normal working hours". Normal working hours shall be those as stated in the applicable Sectorial Determination applicable to a 5 (five) day week (Monday to Friday) from 07:00 to 17:00. Non-working days are Saturdays and Sundays and special non-working days are public holidays, election day of the local government elections and national elections (when applicable) and the official builder's holidays as defined by SAFCEC.
5.8.1.5	<u>Add the following additional Clause to Clause 5.8</u> "The cost of supervision by the Employer's Agent or his representatives outside of normal working hours (Monday to Friday) in accordance with this Clause shall be to the Contractor's account".

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause	Contract Data																												
5.12.2.2	<u>Add to Clause 5.12.2.2:</u> The time period specified as the time for completion includes allowances for those days on which it is expected that work, on the critical path items of the works, would be prevented due to weather conditions such as wind, rain falling or the subsequent waterlogged condition. Based on average weather conditions of wind, rain and sunshine the allowances are: <table border="1"> <thead> <tr> <th>MONTH</th><th>Allowable days per month</th></tr> </thead> <tbody> <tr><td>January</td><td>3</td></tr> <tr><td>February</td><td>3</td></tr> <tr><td>March</td><td>3</td></tr> <tr><td>April</td><td>3</td></tr> <tr><td>May</td><td>3</td></tr> <tr><td>June</td><td>3</td></tr> <tr><td>July</td><td>3</td></tr> <tr><td>August</td><td>3</td></tr> <tr><td>September</td><td>3</td></tr> <tr><td>October</td><td>3</td></tr> <tr><td>November</td><td>3</td></tr> <tr><td>December</td><td>3</td></tr> <tr><td>TOTAL</td><td>36</td></tr> </tbody> </table> If the Contractor has been prevented by these weather conditions from working on the critical path items of the works, then he must notify the Employer's Agent in writing. The submission shall be made within five calendar days of the resumption of work. The Employers Agent 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 items was prevented, exceeds the total number of days calculated in terms of the above allowance and considering the official contract period as a whole. The tendered sums of the appropriate time-related items shall be increased to take account of the extensions of time granted.	MONTH	Allowable days per month	January	3	February	3	March	3	April	3	May	3	June	3	July	3	August	3	September	3	October	3	November	3	December	3	TOTAL	36
MONTH	Allowable days per month																												
January	3																												
February	3																												
March	3																												
April	3																												
May	3																												
June	3																												
July	3																												
August	3																												
September	3																												
October	3																												
November	3																												
December	3																												
TOTAL	36																												
5.12.2.4	<u>Amend the clause to read as follows:</u> "Any disruption which is entirely beyond the Contractor's control except for internal (contractors own or his subcontractors labour) unrest, disruptions, strikes, lock-outs, etc.																												
5.12.5	<u>Add the following new sub-clause to Clause 5.12</u> 5.12.5 Critical Path Provision A delay in so far as extension of time is concerned, will be regarded as a delay only if, on a claim by the Contractor in accordance with the General Conditions of Contract, the Employer's Agent rules that all progress on an item or items of work on the critical path of the approved programme for the execution of the Works by the Contractor, has been brought to a halt. Delays on normal working days only, based on a working week, of five normal working days, will be taken in account for the extension of time.																												

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause	Contract Data
5.13.1	The penalty for failing to complete the Works within the abovementioned time limit, plus approved extensions of time or condonation thereof is R2 500.00 (VAT inclusive) per calendar day.
5.14.1	Partial practical completion shall only be granted once all civil, mechanical and electrical components of a process is completed as per the bill of quantities and project specifications. Practical completion on the project shall only be granted once all the processes of the wastewater treatment facility are functional and can be operated by the Employer to their full extent.
5.14.5.5	<u>Delete Clause 5.14.5.5 and replace with:</u> "Insurance of the works shall continue until the expiration of the Defects Liability Period, in terms of the new Clause 8.6 contained in this Contract Data."
5.16.3	The latent defect period is ten (10) years for Civil Engineering works
6.2.1	Replace the wording "as selected" in Clause 6.2.1 with "as stated". The security to be provided by the Contractor for each work assignment shall be: - a performance guarantee of ten per cent (10%) of the Contract Sum, plus - retention money of ten per cent (10%), amounting to five per cent (5%) of the Contract Price. Retention monies due shall be subjected to Clauses 6.10.1.3 and 6.10.3. The performance guarantee shall be from an approved Insurance Company or Financial Institution to be jointly and severally bound with the Contractor, in accordance with the provisions of the Form of Guarantee. The wording of the performance guarantee shall be identical to the pro-forma provided under Clause C 1.3: Form of Guarantee of the Contract Data.
6.2.2	<u>Replace the entire contents of Clause 6.2.2 with the following:</u> "If the Contractor fails in his obligations to provide the stated security within the period stated in Clause 5.3.2, or if the performance guarantee shall differ from the pro-forma provided under Clause C 1.3: Form of Guarantee of the Contract Data, the Employer may terminate the Contract in terms of Clause 9.2."
6.2.3	<u>Replace the entire contents of Clause 6.2.3 with the following:</u> "The Contractor shall ensure that the performance guarantee remains valid and enforceable until the issue of the Certificate of Completion."

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause	Contract Data
6.8.2	The application of a Contract Price Adjustment factor will NOT apply to this Contract.
6.8.3	Price Adjustments for variations in the cost of special materials is NOT allowed .
6.10.1.5	The percentage advance on materials not yet built into the Permanent Works is 80%.
6.10.3	<u>Replace the entire contents of Clause 6.10.3 with the following:</u> "Payment of the amounts referred to in Clauses 6.10.1.1, 6.10.1.2, 6.10.1.3 and 6.10.1.4 shall be subject to a retention by the Employer of an amount (called the "retention money"), being the percentage retention stated in the Contract Data, of the said amounts due to the Contractor, until the retention money reaches the "Limit of retention money" stated in the Contract Data." The percentage Performance Guarantee is 10%. The limit of retention money is 5% of the Contract Price at the time of the Agreement made in terms of the Form of Offer and Acceptance coming into effect.
6.10.4	<u>Amend the following clause:</u> Replace the wordings "within 7 days" and "within 28 days" in Clause 6.10.4 with the wording "within 5 working days" and "within 30 days".
6.10.4	<u>Add the following sub-clause 6.10.4.1:</u> "The Contractor is required to submit the complete, correct and signed monthly Expanded Public Works Programme (EPWP) reports, attached to this tender document as Annexure C5.3, together with the monthly payment certificate. If the contractors choose to delay submitting payment certificate, labour returns shall still be submitted as per frequency and timeframe stipulated by the Employer. Payment to the Contractor will not be processed until the EPWP reporting or any other reports as agreed to for the specific month is provided. In addition, a penalty for late submission of R1 500.00 per day will be applicable for every day after the 5th working day of the subsequent month to the reporting month. The completed EPWP reporting template should be accompanied by the following supporting documents: • Contract of employment (Individual and/or Entity) • Certified South African ID copy (certification date not older than 3 months) • Payment and attendance register. • Schedule of payment for SMMEs The Consultant shall, before certifying a contractor's payment certificate, ensure that contractor has submitted labour information in a format and timeframe specified by the employer. The original payment certificates with all monthly reports should be submitted to the Employer on or before the 20th of every month.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause	Contract Data
	If the information submitted by the contractor is inadequate the consultant shall not submit the payment certificate to the employer for payment. If the contractor chooses to delay submitting payment invoices, labour information shall still be submitted as per frequency and timeframe stipulated by the Employer. The contractor's invoice shall not be paid until all pending labour information has been submitted."
6.11.1.3	In line 3 of the second paragraph delete "15" and replace it with "30%".
8.6 8.6.1	<u>Delete Clause 8.6. and replace with the following:</u> Notwithstanding the provisions contained in the General Conditions of Contract regarding insurance, and without limiting the obligations, liabilities and responsibilities of the Contractor in any way whatsoever, and on the understanding that the Contractor is not relieved from his obligations towards the Employer regarding the provision (by the Contractor) of any other insurances, the Employer shall effect and maintain for the duration of the Contract until the expiry of the Defects Liability Period, including initial transit to the Contract site - Contract Works Insurance (including SASRIA Insurance) and - Public Liability (Third Party) Insurance both in the joint names of the Employer and the Contractor (including all Sub-Contractors whether nominated or otherwise), and those on whose behalf the Employer has authority to arrange insurance. The Contractor shall pay for all deductibles incurred as a result of claims made under the Contract. The Policy will be subject to the normal terms, exceptions and conditions applicable to such insurance and will provide the following cover: <u>Section 1 — The Contract Works</u> a) The Contract Works to be undertaken in terms of the Insured Contract, including all temporary works erected or in the course of erection and all materials for incorporation therein. "Temporary Works" shall mean all constructional aids, equipment or structures (not being part of the permanent works) used or intended for use on the Insured Contract and which (i) do not comprise mobile plant, (ii) the Insured does not intend to remove from the Contract Site on completion of the Contract, and/or (iii) have no residual value at the completion of the Contract (other than scrap value) solely due to their specialized nature, to the extent that the value has been included in the Contract price. b) Surrounding property (as defined in the Policy) not included in nor forming part of the property insured under Item 1 above.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause	Contract Data
	<u>Section 2 — Contract Liability</u> Indemnity against the insured parties' legal liability in the event of accidental death of or injury to third party persons and/or accidental loss of or damage to third party property arising directly from the execution of the contract. THE SUMS INSURED/LIMIT OF LIABILITY SECTION 1 - CONTRACT WORKS a) Property insured under Section 1 (a) The Contract Works The Agreed and Accepted Contract Value (subject to a maximum of R100m) in respect of any one Contract plus a maximum of 25% escalation, unless the Insurers' agreement to amend these limits is obtained in writing. b) Property insured under Section 1 (b) Surrounding Property R2,500,000 each and every loss SECTION 2 - CONTRACT LIABILITY Limit of Indemnity R 20,000,000 (Two Million Rand) for any one occurrence or series of occurrences arising out of one event. EXCLUDED CONTRACTS The following Contracts are specifically excluded from the "blanket" cover arranged by the Employer, and insurance cover will not be arranged by the Employer. The Employer shall arrange with the Insurer for specific insurance cover for these contracts, and shall confirm such arrangement and all specific Terms & Conditions of such policy with the Contractor in writing. 1. Any Contract with a Contract Price at award of over R100,000,000 2. Any Contract with a construction period at award exceeding 24 months 3. Any Contract with a Maintenance or Defects Liability Period exceeding 12 months 4. Any Contract involving 4.1 Underground Mine or Colliery Working 4.2 Tunnelling 4.3 Foul Berthing 4.4 Stevedoring Work 4.5 "Wet" work at or about or connected with dams, docks, harbours, piers, breakwaters or otherwise involving construction in water.
8.6.3	The Employer will pay all premiums in connection with the insurance effected by the Employer In the event of any occurrence which is likely to give rise to a claim under the insurance arranged by the Employer, the Contractor or sub-Contractor shall

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause	Contract Data
	a) in addition to any statutory requirement or other requirements contained in the Conditions of Contract, immediately notify the Employer's Insurance Brokers by telephone or in writing giving the circumstances, nature and an estimate of the loss or damage; b) complete a Claims Advice Form available from the Insurance Brokers to whom the form shall be returned without delay — a copy shall be sent to the Employer's Agent; c) Negotiate the settlement of claims with the Insurers through the Employer's Insurance Brokers, subject to the settlement being approved by the Employer. The Employer and Insurers shall have the right to make all and any enquiries, either on site or elsewhere, as to the cause and results of any such occurrence and the Contractor shall give full facilities for carrying out such enquiries.
8.6.4	Any amount which becomes payable as a result of a claim by the Contractor under the insurance effected by the Employer shall be paid net of the deductibles to the Employer, who shall pay the said amount to the Contractor upon rectification, repair or reinstatement the loss or damage, but this provision shall not in any way affect the Contractor's obligations, liabilities and responsibilities in terms of the Contract.
8.6.5	Submission of a Tender shall be deemed as acceptance by the Contractor that he is satisfied with the scope of the insurances effected by the Employer.
8.6.6	The Contractor and/or Sub-Contractor shall provide, as a minimum, the following: a) Proof of registration with the Department of Labour as an employer, in terms of the Compensation for Occupational Injuries and Diseases Act 1993, as amended b) Common Law Liability Insurance for the duration of the Contract Period and with a minimum Limit of Indemnity of not less than R1 000 000 for any one accident c) Insurance on an All-Risks basis for construction plant, equipment and other things (except those intended to incorporation into the works) brought onto the site to the full value of such construction plant, equipment and other things d) Motor Vehicle Liability Insurance, comprising a minimum of Balance of Third-Party motor risks, including Passenger Liability, subject to a minimum limit of R2,5 million e) 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

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause	Contract Data
	f) Imported equipment or component parts or materials to be supplied in terms of this Contract which require any process of assembly or finishing in South Africa prior to delivery to the site are to be insured by the Contractor up to the commencement of transit to site of the assembled or finished equipment, component parts or materials, unless special arrangements are made with the Employer. These insurances shall be maintained in force for the duration of the Contract, including any Defects Liability Period and in respect of Sub-Contractors, the Contractor shall be deemed to have complied with the provisions of the requirements relating to insurance by ensuring that the Sub-Contractors have affected such insurance.
8.6.7	The Contractor may affect, at his own cost, any insurance additional to that effected by the Employer which he deems necessary in his own interests. The Employer reserves the right to call for full information regarding such insurances.
8.6.8	The insurances to be provided by the Contractor and Sub-Contractor shall be affected with Insurers and on terms approved by the Employer (which approval shall not be unreasonably withheld) and the Contractor shall, if required by the employer, produce to the employer the Policy or Policies of insurance and the receipts for payment of the current premiums.
8.6.9	If the Contractor fails to effect and keep in force the insurances referred to, then the employer may affect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and, from time to time, deduct the amount paid by the Employer from any monies due or which may become due to the Contractor or recover same as a debt from the Contractor.
8.6.10	Where the Contractor is responsible for the appointment of Sub-Contractors, then the Contractor shall
8.6.11	a) ensure that potential and appointed Sub-Contractors are aware of the whole content of this Special Conditions of Contract Clause; and b) ensure the compliance of Sub-Contractors with this Special Conditions of Contract clause, where applicable. The Contractor warrants that he shall give all notices and shall observe all the terms and conditions and requirements of all insurances applicable to this Contract.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Clause	Contract Data
9.1.4	<u>Replace Clause 9.1.4 with the following:</u> "Up to the time of termination of the contract by either party in terms of this Clause, or until the Contractor gives notice in terms of this Clause to terminate the contract and the Contractor is precluded from exercising his right to terminate the contract because the Employer agrees to bear any resultant additional costs provided for in Clause 9.1.2.2 hereof, the Contractor: (h) will be entitled to an extension of calendar time for working days lost as may be approved by the Employer's Agent, and (i) will be reimbursed the cost of delays per working day, where the number of working days will be determined pro rata the effect the delays have on the progress of the work as agreed with the Employer's Agent. Payment in full and final settlement will be made at the rates tendered for the payment items specially provided in the Bill of Quantities. Where the circumstances described in Clauses 9.1.1 and 9.1.2 are applicable only to a certain portion of the contract, the Employer's Agent will decide after consulting the Contractor, to what extent the contract as a whole is affected and whether or not a claim in terms of this Clause can be submitted. No payment will be made in terms of this Clause after the expiry of the due completion date."
10.3.2	Amicable settlement in terms of Clause 10.4 shall be contemplated for all disputes prior to referring any dispute to adjudication or arbitration.
10.5.1	Dispute resolution shall be by ad-hoc adjudication.
10.5.3	The number of Adjudication Board Members to be appointed is one (1).
10.7.1	The determination of disputes which are unresolved in terms of Clause 10.5.3 shall be by arbitration.
11	<u>Add the following additional clause:</u> "11 Details to be confidential The Contractor shall treat the details of the Works comprised in this Contract as private and confidential (save in so far as may be necessary for the purposes hereof) and shall not publish or disclose the same or any particulars thereof in any trade or technical paper elsewhere without the prior written consent of the Employer's Agent."

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C1.3: Contract Data (Part 2)

Part 2: Data provided by the Contractor

Clause	Contract Data																																							
1.1.1.9	The name of the Contractor is: _____ _____																																							
1.2.1.2	The Contractor's address for receipt of communications and notices is: Telephone: _____ Facsimile: _____ E-mail: _____ Address: _____ _____																																							
5.12.1	The time for completing the works is.....weeks.																																							
6.5.1.2.3	The allowances percentage of the following items must be completed: <table> <tr> <td>Percentage Allowance for Workman:</td><td>Labour</td><td>_____ %</td></tr> <tr> <td></td><td>Machinery</td><td>_____ %</td></tr> <tr> <td>Percentage Allowance for Materials:</td><td>Cost of Material</td><td>_____ %</td></tr> <tr> <td></td><td>Contractor Profit</td><td>_____ %</td></tr> <tr> <td></td><td>Subcontractor Profit</td><td>_____ %</td></tr> <tr> <td></td><td>Time Keeping</td><td>_____ %</td></tr> <tr> <td></td><td>Clerical work</td><td>_____ %</td></tr> <tr> <td></td><td>Insurance</td><td>_____ %</td></tr> <tr> <td></td><td>Establishment</td><td>_____ %</td></tr> <tr> <td></td><td>Superintendence</td><td>_____ %</td></tr> <tr> <td></td><td>Hand tools</td><td>_____ %</td></tr> <tr> <td></td><td>Other</td><td>_____ %</td></tr> <tr> <td></td><td>Total:</td><td><u>100</u> %</td></tr> </table>	Percentage Allowance for Workman:	Labour	_____ %		Machinery	_____ %	Percentage Allowance for Materials:	Cost of Material	_____ %		Contractor Profit	_____ %		Subcontractor Profit	_____ %		Time Keeping	_____ %		Clerical work	_____ %		Insurance	_____ %		Establishment	_____ %		Superintendence	_____ %		Hand tools	_____ %		Other	_____ %		Total:	<u>100</u> %
Percentage Allowance for Workman:	Labour	_____ %																																						
	Machinery	_____ %																																						
Percentage Allowance for Materials:	Cost of Material	_____ %																																						
	Contractor Profit	_____ %																																						
	Subcontractor Profit	_____ %																																						
	Time Keeping	_____ %																																						
	Clerical work	_____ %																																						
	Insurance	_____ %																																						
	Establishment	_____ %																																						
	Superintendence	_____ %																																						
	Hand tools	_____ %																																						
	Other	_____ %																																						
	Total:	<u>100</u> %																																						

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



6.8.3	The contractor is to list below any special materials on which any increase or decrease in price must be considered separately from any contract price adjustment formula:		
	Type Material	Unit	Rate or Price

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C1.4: Performance Guarantee (Pro Forma)

PERFORMANCE GUARANTEE

For use with the General Conditions of Contract for Construction Works, Third Edition (2015).

GUARANTOR DETAILS AND DEFINITIONS

"Guarantor" means:

"Physical address:

"Employer" means: PHUMELELA LOCAL MUNICIPALITY

"Contractor" means:

"Employer's Agent " means:

"Works" means:

"Site" means:

"Contract" means: The Agreement made in terms of the Form of Offer and Acceptance and such amendments or additions to the Contract as may be agreed in writing between the parties.

"Contract Sum" means: The accepted amount inclusive of tax of R

Amount in words:

"Guaranteed Sum" means: The maximum aggregate amount of R

Amount in words:

"Expiry Date" means:.....(*Given date*) or any other later date set by the Contractor and /or Employer provided such instruction is received prior to the Expiry date as indicated.

CONTRACT DETAILS

Employer's Agent issues: Interim Payment Certificates, Final Payment Certificate and the Performance Certificate as defined in the Contract.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



PERFORMANCE GUARANTEE

1. The Guarantor's liability shall be limited to the amount of the Guaranteed Sum.
2. The Guarantor's period of liability shall be from and including the date of issue of this Performance Guarantee and up to and including the Expiry Date or the date of payment in full of the Guaranteed Sum, whichever occurs first. The Employer's Agent and/or the Employer shall advise the Guarantor in writing of the date on which the Performance Certificate has been issued.
3. The Guarantor hereby acknowledges that:
 - 3.1 any reference in this Performance Guarantee to the Contract is made for the purpose of convenience and shall not be construed as any intention whatsoever to create an accessory obligation or any intention whatsoever to create a suretyship;
 - 3.2 its obligation under this Performance Guarantee is restricted to the payment of money.
4. Subject to the Guarantor's maximum liability referred to in 1, the Guarantor hereby undertakes to pay the Employer the sum certified upon receipt of the documents identified in 4.1 to 4.3:
 - 4.1 A copy of a first written demand issued by the Employer to the Contractor stating that payment of a sum certified by the Employer's Agent in an Interim or Final Payment Certificate has not been made in terms of the Contract and failing such payment within seven (7) calendar days, the Employer intends to call upon the Guarantor to make payment in terms of 4.2;
 - 4.2 A first written demand issued by the Employer to the Guarantor at the Guarantor's physical address with a copy to the Contractor stating that a period of seven (7) calendar days has elapsed since the first written demand in terms of 4.1 and the sum certified has still not been paid;
 - 4.3 A copy of the aforesaid payment certificate which entitles the Employer to receive payment in terms of the Contract of the sum certified in 4.
5. Subject to the Guarantor's maximum liability referred to in 1, the Guarantor undertakes to pay to the Employer the Guaranteed Sum or the full outstanding balance upon receipt of a first written demand from the Employer to the Guarantor at the Guarantor's physical address calling up this Performance Guarantee, such demand stating that:
 - 5.1 the Contract has been terminated due to the Contractor's default and that this Performance Guarantee is called up in terms of 5; or
 - 5.2 a provisional or final sequestration or liquidation court order has been granted against the Contractor and that the Performance Guarantee is called up in terms of 5; and
 - 5.3 the aforesaid written demand is accompanied by a copy of the notice of termination and/or the provisional/final sequestration and/or the provisional liquidation court order.
6. It is recorded that the aggregate amount of payments required to be made by the Guarantor in terms of 4 and 5 shall not exceed the Guarantor's maximum liability in terms of 1.
7. Where the Guarantor has made payment in terms of 5, the Employer shall upon the date of issue of the Final Payment Certificate submit an expense account to the Guarantor showing how all monies received in terms of this Performance Guarantee have been expended and shall refund to the Guarantor any resulting surplus. All monies refunded to the Guarantor in terms of this Performance Guarantee shall bear interest at the prime overdraft rate of the Employer's bank

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



compounded monthly and calculated from the date payment was made by the Guarantor to the Employer until the date of refund.

8. Payment by the Guarantor in terms of 4 or 5 shall be made within seven (7) calendar days upon receipt of the first written demand to the Guarantor.
9. 9. The Employer shall have the absolute right to arrange his affairs with the Contractor in any manner which the Employer may deem fit and the Guarantor shall not have the right to claim his release from this Performance Guarantee on account of any conduct alleged to be prejudicial to the Guarantor.
10. The Guarantor chooses the physical address as stated above for the service of all notices for all purposes in connection herewith.
11. This Performance Guarantee is neither negotiable nor transferable and shall expire in terms of 2, whereafter no claims will be considered by the Guarantor. The original of this Guarantee shall be returned to the Guarantor after it has expired.
12. This Performance Guarantee, with the required demand notices in terms of 4 or 5, shall be regarded as a liquid document for the purposes of obtaining a court order.
13. Where this Performance Guarantee is issued in the Republic of South Africa the Guarantor hereby consents in terms of Section 45 of the Magistrate's Courts Act No 32 of 1944, as amended, to the jurisdiction of the Magistrate's Court of any district having jurisdiction in terms of Section 28 of the said Act, notwithstanding that the amount of the claim may exceed the jurisdiction of the Magistrate's Court.

Signed at

Date

Guarantor's signatory (1)

Capacity

Guarantor's signatory (2)

Capacity

Witness signatory (1)

Witness signatory (2)

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C1.5: Occupational Health and Safety Agreement

Refer to **C5.2: HEALTH AND SAFETY SPECIFICATION**.

Bidder to complete Agreement with Mandatory below.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



AGREEMENT WITH MANDATORY

In terms of Section 37 (1) and (2)

WRITTEN AGREEMENT ENTERED INTO AND BETWEEN

PHUMELELA LOCAL MUNICIPALITY

(Herein after referred to as the "CLIENT")

AND

(Herein after referred to as the Contractor)

Each page as well as each change made to be initialled.

DEFINITION OF MANDATORY:

Includes an agent, a Contractor or Sub-Contractor for work, but without derogating from his status in his own right as an Employer or User.

SECTION 37 (1)

Whenever an employee does or omits to do any act which it would be an offence in terms of this Act for the employer or such employee or a user to do or omit to do, then, unless it is provided that:-

- (a) in doing or omitting to do that act the employee was acting without the connivance or permission of the employer or any such user;
- (b) it was not under any condition or in any circumstances within the scope of the authority of the employee to do or omit to do an act, whether lawful or unlawful, of the character of the act or omissions charged, and
- (c) all reasonable steps were taken by the Employer or any such user to prevent any act or omission of the kind in question.

The employer or any such user himself shall be presumed to have done or omitted to do that Act, and shall be liable to be convicted and sentenced in respect thereof; and the fact that he issued instructions forbidding any act or omissions of the kind in question shall not, in itself, be accepted as sufficient proof that he took all reasonable steps to prevent the act or omission.

SECTION 37 (2)

The provision of subsection (1) shall *mutates mutandis* apply in the case of a mandatory of employer or user, except if the parties have agreed in writing to the arrangements and procedures between them to ensure compliance by the mandatory with the provisions of this Act.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



ACCEPTANCE BY MANDATORY

In terms of Section 37 (2) of the OHS Act 85 of 1993, I _____

Representing _____ responsible for carrying out
(Contractor Company Name)

_____ at the _____
(describe activity) (contract/site name)

undertake to ensure that the requirements and provisions of the OHS Act and Construction Regulations are complied with.

Section 16 (2) for Contractor

Date

Employer

Date

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C1.6: Protection of the Environment Declaration

PROTECTION OF THE ENVIRONMENT DECLARATION

The Contractor will not be given right of access to the Site until this form has been signed.

CONTRACT NO.: **PLMT 24-25/01, : APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS**

I/ we, ...{Contractor} record as follows:

1. I/ we, the undersigned, do hereby declare that I/ we am/ are aware of the increasing requirement by society that construction activities shall be carried out with due regard to their impact on the environment.
2. In view of this requirement of society and a corresponding requirement by the Employer with regard to this Contract, I/ we will, in addition to complying with the letter of the terms of the Contract dealing with protection of the environment, also take into consideration the spirit of such requirements and will, in selecting appropriate employees, plant, materials and methods of construction, in-so-far as I/ we have the choice, include in the analysis not only the technical and economic (both financial and with regard to time) aspects but also the impact on the environment of the options. In this regard, I/ we recognise and accept the need to abide by the "precautionary principle" which aims to ensure the protection of the environment by the adoption of the most environmentally sensitive construction approach in the face of uncertainty with regard to the environmental implications of construction.
3. I/ we declare that I/ we have read and understood the contents of the Environmental Management Programme (which is comprised of the Environmental Management Specification and its Annexures) for this Contract, and that I/ we understand my/our responsibilities in terms of enforcing and implementing the Environmental Management Programme. I/ we also declare that I/ we have made appropriate provision in my/ our pricing of the Bills of Quantities items for the Environmental Management Programme.
4. I/ we acknowledge and accept the right of the Employer to deduct, should he so wish, from any amounts due to me/ us, such amounts (hereinafter referred to as fines) as the Employer's Agent shall certify as being warranted in view of my/ our failure to comply with the terms of the Contract dealing with protection of the environment, subject to the following:
 - 4.1 The Employer's Agent, in determining the amount of such fine, shall take into account, *inter alia*, the nature of the offence, the seriousness of its impact on the environment, the degree of prior compliance/non-compliance, the extent of the Contractor's overall compliance with environmental protection requirements and, in particular, the extent to which he considers it necessary to impose a sanction in order to eliminate/reduce future occurrences
 - 4.2 The Employer's Agent shall, with respect to any fine imposed, provide me/ us with a written statement giving details of the offence, the facts on which the Employer's Agent has based his assessment and the terms of the Contract (by reference to the specific clause) which has been contravened.

Signed

Date

Contractor

Witness 1

Witness 2

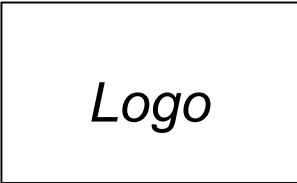
Employer

Witness 1

Witness 2

C1.7: Insurance Broker's Warranty

Pro Forma



Letterhead of Contractor's Insurance Broker

Date

Dear Sir

CONTRACT NO.: **PLMT 24-25/01**

CONTRACT TITLE: **APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS**

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 Phumelela Local 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:

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C1.8: Contract Employment as Community Liaison Officer

CONTRACT NO.: PLMT 24-25/01

CONTRACT TITLE: **APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS**

AGREEMENT made between the CONTRACTOR

and the Community Liaison Officer.....,

hereafter referred to as the CLO, for the appointment and employment of a CLO for the duration of the work in respect of the above-named construction contract.

THE PARTIES HAVE AGREED THAT

The CLO will be employed by the CONTRACTOR on a temporary basis for the duration of the work from the date of signing this agreement to the date of practical completion as defined in the Contract, subject to all the conditions set out below.

THE DUTIES OF THE COMMUNITY LIAISON OFFICER SHALL BE:

- to keep the community informed on the progress of the project;
- to keep the Contractor informed on relevant Community affairs and possible grievances;
- to manage the recruitment of workers from the Sub-Council Job-Seekers Database;
- to assist the Contractor's supervisory staff in the management of the workers.

THE FOLLOWING CONDITIONS OF EMPLOYMENT SHALL APPLY:

The Conditions of Temporary Employment as applicable on this Contract for the workers recruited from the Community shall apply equally to the CLO, except that the rate of remuneration shall be R365.00 per working day. These conditions that apply are listed below as they appear in the Contract of Temporary Employment:

If required to work on a statutory public holiday or Sunday the payment will be double the amount stated in the previous paragraph.

Maximum hours of work:

- 9¼ hours per day
- 45 hours per week;
- 5 days per week;
- 5 hours without an interval, whereupon there shall be an interval of at least 30 minutes;
- A spread-over period of 12 hours.

The CLO shall be entitled to payment where he is prevented from working by reasons which are within the control of the Contractor.

On days when it is raining the Contractor may, before 9 a.m., decide not to open the site and there will be no pay.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



If the Contractor closes the site between 9 a.m. and 1 p.m., the CLO will be paid half the daily wage.

If the site works later than 1 p.m., the CLO will be paid the full daily wage.

Workers and the CLO will not be permitted to work under conditions of:

- undisciplined or unruly behaviour;
- insubordination to Team Leader, Supervisors or Management;
- abuse of intoxicating substances;
- criminal actions by the employee;
- strike action or political stayaways.

Workers, including the CLO, may be dismissed after two official written warnings for the following behaviour:

- undisciplined or unruly behaviour;
- insubordination to Team Leader, Supervisors or Management;
- abuse of intoxicating substances;
- wilful or negligent damage to or loss of machines or equipment.

The Contractor shall ensure that he has statements from at least two witnesses concerning any of the above situations.

The Contractor shall inform the CLO within 24 hours of any warning issued to workers employed from the Job-Seekers Database.

The CLO will be paid on a Friday afternoon every two weeks, one week in arrears.

The CLO shall be given a statement with each payment on which is recorded:

- the name of the Contractor;
- the CLO's name;
- the number of days worked by the CLO;
- the rate per day;
- the details of any deductions made;
- the actual amount paid to the CLO.

No deduction shall be made from the remuneration except where the CLO consents in writing or unless the Contractor is permitted or required to do so by law or the order of any competent court.

The CLO shall be supplied free of charge with all health and safety equipment required by the Occupation Health and Safety Act. The equipment shall remain the property of the Contractor.

The Contractor must give the CLO at least one week's notice of the termination of the Contract of Temporary Employment. If this is not done, the CLO must be paid earnings for five days. This condition does not apply if the CLO is dismissed.

At the end of the period of temporary employment, the Contractor shall provide a Certificate of Service recording the Contractor's name, the CLO's name and address, the period of service, the type of work on which the CLO was engaged and the rate of remuneration on termination.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



TERMINATION OF AGREEMENT

If the CLO can no longer perform and execute his/her duties as detailed in this agreement, this agreement will be terminated without prejudice to any rights under this agreement.

THE CONDITIONS OF THIS AGREEMENT

The parties expressly declare that this agreement contains all the conditions negotiated between them, and no condition or stipulation not contained herein shall be binding upon the parties.

THUS AGREED AND SIGNED BY THE PARTIES:

Contractor:

Community Liaison officer:

Date:.....

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



PHUMELELA LOCAL MUNICIPALITY

BID NUMBER : PLMT 24-25/01

**APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT
OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS**

THE CONTRACT: PART C2 **PART 2 (OF 5): PRICING DATA**

CONTENTS

C2.1	Pricing Instructions
C2.2	Bill of Quantities

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C2.1: Pricing Instructions

1. The General Conditions of Contract, the Contract Data, the Specifications (including the Project Specifications) and the Drawings shall be read in conjunction with the Bill of Quantities.
2. The Bill comprises items covering the Contractor's profit and costs of general liabilities and of the construction of Temporary and Permanent Works.

Although the Bidder is at liberty to insert a rate of his own choosing for each item in the Bill, he should note the fact that the Contractor is entitled, under various circumstances, to payment for additional work carried out and that the Employer's Agent is obliged to base his assessment of the rates to be paid for such additional work on the rates the Contractor inserted in the Bill.

Clause 8 of each Standardized Specification, and the measurement and payment clause of each Particular Specification, read together with the relevant clauses of the Project Specifications, all set out which ancillary or associated activities are included in the rates for the specified operations.

3. Descriptions in the Bill of Quantities are abbreviated and may differ from those in the Standardized and Project Specifications. No consideration will be given to any claim by the Contractor submitted on such a basis. The Bill has been drawn up generally in accordance with the latest issue of Civil Engineering Quantities. Should any requirement of the measurement and payment clause of the appropriate Standardized or Project Specification(s) be contrary to the terms of the Bill or, when relevant, to the Civil Engineering Quantities, the requirement of the appropriate Standardized, Project, or Particular Specification as the case may be, shall prevail.
4. Unless stated to the contrary, items are measured net in accordance with the Drawings without any allowance having been made for waste.
5. The amounts and rates to be inserted in the Bill of Quantities shall be the full inclusive amounts to the Employer for the work described under the several items. Such amounts shall cover all the costs and expenses that may be required in and for the construction of the work described, and shall cover the costs of all general risks, profits, taxes (but excluding value-added tax), liabilities and obligations set forth or implied in the documents on which the Bid is based.
6. The quantities set out in the schedule of quantities are only approximate quantities. The quantities of work finally accepted and certified for payment, and not the quantities given in the schedule of quantities, will be used to determine payments to the contractor.
7. A price or rate MUST be entered against each item in the Schedule of Quantities, whether the quantities are stated or not.

The Bidder shall also fill in a rate against the items where the words "rate only" appear in the amount column. Although no work is foreseen under these items and no quantities are consequently given in the quantity column, the bidden rates shall apply should work under these items actually be required.

The bidden rates, prices and sums shall, subject only to the provisions of the Conditions of Contract, remain valid irrespective of any change in the quantities during the execution of the Contract.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



8. The quantities of work as measured and accepted and certified for payment in accordance with the Conditions of Contract, and not the quantities stated in the Bill of Quantities, will be used to determine payments to the Contractor. The validity of the Contract shall in no way be affected by differences between the quantities in the Bill of Quantities and the quantities certified for payment.

Ordering of materials are not to be based on the Bill of Quantities, but only on information issued for construction purposes.

9. For the purposes of this Bill of Quantities, the following words shall have the meanings hereby assigned to them:

Unit	:	The unit of measurement for each item of work as defined in the Standardized, Project or Particular Specifications
Quantity	:	The number of units of work for each item
Rate	:	The payment per unit of work at which the Bidder bids to do the work
Amount	:	The quantity of an item multiplied by the bidden rate of the (same) item
Sum	:	An amount bidden for an item, the extent of which is described in the Bill of Quantities, the Specifications or elsewhere, but of which the quantity of work is not measured in units

10. The units of measurement indicated in the Bill of Quantities are metric units. The following abbreviations may appear in the Bill of Quantities:

mm	=	millimetre
m	=	metre
km	=	kilometre
km-pass	=	kilometre-pass
m ²	=	square metre
m ² -pass	=	square metre-pass
ha	=	hectare
m ³	=	cubic metre
m ³ -km	=	cubic metre-kilometre
kW	=	kilowatt
kN	=	kilonewton
kg	=	kilogram
t	=	ton (1 000 kg)
%	=	per cent
MN	=	meganewton
MN-m	=	meganewton-metre
Sum	=	lump sum
PC Sum	=	Prime Cost Sum
Prov Sum	=	Provisional Sum

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



CORRECTION OF ENTRIES MADE BY TENDERER

Any entry made by the Tenderer in the Bill of Quantities, forms, etc, which the tenderer desires to change, shall not be erased or painted out. A line shall be drawn through the incorrect entry and the correct entry shall be written above in black ink and the full signature of the Tenderer shall be placed next to the correction.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C2.2: Bill of Quantities

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**SCHEDULE A - PRELIMINARY AND GENERAL**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
A	SANS 1200A	SCHEDULE A: PRELIMINARY AND GENERAL				
A1	8.3	Scheduled fixed-charge and value-related items:				
A1.1	8.3.1	Contractual requirements	Sum	1.00		
	8.3.2	Establishment of facilities on the site				
	8.3.2.1	Facilities for Engineer:				
A1.2		Nameboards	No.	1.00		
A1.3		Engineer's office building	Sum	1.00		
	8.3.2.2	Facilities for Contractor				
A1.4		Offices and storage sheds	Sum	1.00		
A1.5		Living accommodation	Sum	1.00		
A1.6		Ablution and latrine facilities	Sum	1.00		
A1.7		Tools and equipment including survey equipment	Sum	1.00		
A1.8		Water supplies, electrical power and communications	Sum	1.00		
A1.9		Access	Sum	1.00		
A1.10		Provision for Security (Diamond mesh fencing including guard facilities)	Sum	1.00		
A1.11	8.3.3	Other fixed-charge obligations	Sum	1.00		
A1.12	8.3.4	Removal of site establishment	Sum	1.00		
A2	8.4	SCHEDULED TIME-RELATED ITEMS:				
A2.1	8.4.1	Contractual requirements	Sum	1.00		
A2.2	8.4.2	Operate and maintain of facilities on site, for the duration of construction, except where otherwise stated:				
	8.4.2.1	Facilities for Engineer:				
A2.3		Operate and maintain office building	Sum	1.00		
	8.4.2.2	Facilities for Contractor:				
A2.4		Offices and storage sheds	Sum	1.00		
A2.5		Living accommodation	Sum	1.00		
A2.6		Ablution and latrine facilities	Sum	1.00		
TOTAL CARRIED FORWARD						

**SCHEDULE A - PRELIMINARY AND GENERAL**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
A2.7		Tools and equipment	Sum	1.00		
A2.8		Water supplies, electrical power and communications	Sum	1.00		
A2.9		Access	Sum	1.00		
A2.10		Security for the duration of the construction works	Sum	1.00		
A2.11	8.4.3	Supervision for the duration of construction	Sum	1.00		
A2.12	8.4.4	Company and head office overhead costs for the duration of the contract	Sum	1.00		
A3	8.6	PRIME COST ITEMS				
A3.1		Additional tests required by the Employer's Agent	PC Sum	1.00	50 000.00	50 000.00
A3.2		Charge required by Contractor on subitem A4.1 above	%	50 000.00		
A3.3		Accommodation for Employer's Agent's representative	PC Sum	1.00	80 000.00	80 000.00
A3.4		Charge required by Contractor on subitem A4.3 above	%	80 000.00		
A3.5		Transportation for the Employer's Agent Representative	PC Sum	1.00	80 000.00	80 000.00
A3.6		Charge required by Contractor on subitem A4.5 above	%	80 000.00		
A3.7		Telephone and communication facilities for the Engineer's Representative	Prov Sum	1.00	15 000.00	15 000.00
A3.8		Overheads, charges and profit on subitem 4.7 above	%	15 000.00		
A3.9		Photocopying machine for the Engineer's Office	Prov Sum	1.00	7 500.00	7 500.00
A3.10		Overheads, charges and profit on subitem 4.9 above	%	7 500.00		
A3.11		Provisional sum for compilation of the O&M Manual	Prov Sum	1.00	25 000.00	25 000.00
A3.12		Charge required by Contractor on subitem A5.9	%	25 000.00		
A3.13		Maintenance inspection on all equipment within wastewater treatment works (once a month)	No	12.00		
		Documents to be submitted:				
		a. Maintenance checklist of all equipment				
		b. Operations difficulties				
		<i>Note: No CPA is applicable on this item</i>				
TOTAL CARRIED FORWARD						

**SCHEDULE A - PRELIMINARY AND GENERAL**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
A4	PSA 8.7	Daywork (provisional):				
		Labour				
A4.1		Artisan	h	40.00		
A4.2		Skilled labour	h	40.00		
A4.3		Semi-skilled labour	h	40.00		
A4.4		Unskilled labour	h	40.00		
		Materials				
A4.5		Allow for all-inclusive materials actually used	PC Sum	1.00	200 000.00	200 000.00
A4.6		Charge required by Contractor on subitem A6.5 above	%	200 000.00		
	PSA 8.7	Equipment				
A4.7		Case 580F or similar	h	20.00		
A4.8		Hitachi Ex 200 or similar	h	20.00		
A4.9		Caterpillar 140G or similar	h	20.00		
A4.10		6m³ tipper	h	20.00		
A4.11		1 ton light delivery vehicle	km	500.00		
A4.12		Bomag BW 76S or similar	day	20.00		
A4.13		20m³/h water pump	day	20.00		
A4.14		250 A DC welder	day	20.00		
A4.15		Compressor (breakers and piping included)	day	20.00		
A5		Community Liaison Officer (CLO) and Project Steering Committee (PSC):				
A5.1	PSA 8.5	Allow for remuneration for Community Liaison Officer (CLO)	Prov Sum	1.00	45 000.00	45 000.00
A5.2		Overheads, charges and profit on subitem A5.1 above	%	45 000.00		
A5.3		Allow for mobile phone allowance for CLO	Prov Sum	1.00	5 000.00	5 000.00
A5.4		Overheads, charges and profit on subitem A5.3 above	%	10 000.00		
A5.5		Allow for payment of PSC members for attending meetings	Prov Sum	1.00	15 000.00	15 000.00
A5.6		Overheads, charges and profit on subitem A5.5 above	%	15 000.00		
TOTAL CARRIED FORWARD						

**SCHEDULE A - PRELIMINARY AND GENERAL**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
A6	SPEC	Health and safety :				
A6.1	PSA 8.9	Compliance with OHS act and regulations	Sum	1.00		
A6.2	8.6	Health and Safety Agent (Employer's Agent)	PC Sum	1.00	90 000.00	90 000.00
A6.3		Overheads, charges and profit on subitem A6.2 above	%	90 000.00		
		Penalty for non-compliance with the Occupational Health and Safety Specification:				
A6.4		a) Fixed penalty per occurrence	No		-5 000.00	Rate only
A6.5		b) Time related penalty	day		-2 500.00	Rate only
A7	SPEC EM	Environmental management :				
A7.1		Compliance with environmental management specification	Sum	1.00		
A7.2	PSA 8.5	Environmental specialist and Health and Safety specialist (Employer's Agent)	PC Sum	1.00	90 000.00	90 000.00
A7.3		Overheads, charges and profit on subitem A7.4above	%	90 000.00		
		Penalty for non-compliance with the environmental management specification:				
A7.4		a) Fixed penalty per occurrence	No		-5 000.00	Rate only
A7.35		b) Time related penalty	day		-2 500.00	Rate only
A8		Temporary works:				
A8.1	8.8.4	Locate, and excavate by hand in all material to expose existing services where ordered by the Employer's Agent	m³	185.00		
A8.2	8.8.6	Accommodation of Water	Sum	1.00		
A9		Training:				
A9.1		Provision for accredited training	Prov Sum	1.00	50 000.00	50 000.00
A9.2		Percentage adjustment on Item A11.1 for Contractor's overheads and profit (state as a percentage and extend as an amount)	%	50 000.00		
A10		Penalty for the delay in progress on project:				
A10.1		Per day	p/day	1.00	-2 500.00	Rate Only
TOTAL CARRIED FORWARD TO SUMMERY						



SCHEDULE B- CIVIL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
		SECTION B1 - GENERAL SITE WORK				
B1.1		Supply and deliver:				
B1.1.1		Fence material:				
B1.1.1.1		2-Layer Security Fence:	m	150.00		
		a. High security clear-vu mesh fence, for a height of 2.4m above ground (W - 3.05m x H - 2.4m)				
		b. Electrical outrigger electrical fence, with a height of 0.8m				
		c. 24 strand on the internal face of clear-vu fence.				
		Supporting posts:				
B1.1.1.2		Hollow tube section to a H-Profile, hot dipped galvanized (HDG) with a PVC Coating	No.	50		
		Dimensions: 80 x 60 x 2mm poles with a total length of 3.8m				
		Including:				
		a. Post caps - Secured to top of poles, not to be removed				
		b. Posts to be pre-drilled before HDG				
		c. No tek screwing on site				
		d. HDG certificates to be supplied for poles				
		e. PVC coated, no powder coating permitted.				
		Corner posts:				
B1.1.1.3		Hollow tube section to a H-Profile, hot dipped galvanized (HDG) with a PVC Coating	No.	8.00		
		Dimensions: 80 x 60 x 2mm poles with a total length of 3.8m				
		Including:				
		a. Post caps - Secured to top of poles, not to be removed				
		b. Posts to be pre-drilled before HDG				
		c. No tek screwing on site				
		d. HDG certificates to be supplied for poles				
		e. PVC coated, no powder coating permitted.				
B1.1.1.4		Sliding Gate as per drawing 176-650	No	1.00		
B1.1.2		Installation:				
B1.1.2.1		3-Layer security fence, including posts and corner posts	m	150.00		
B1.1.2.2		Sliding gate, including fixtures, fasteners etc.	No	1.00		
B1.2		Additional security measures required by Engineer	Prov Sum	1.00	50 000.00	50 000.00
TOTAL CARRIED FORWARD						



SCHEDULE B- CIVIL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
B2		SECTION B2 - INTERCONNECTING PIPEWORK				
B2.1	SANS	Site clearance:				
B2.1.1	8.2.1	Clear and Grub on pipe routes (2.5 m wide strip)	m	480.00		
B2.2		Removal of waste:				
B2.2.1		Removal of solid and foreign materials from grit chambers, manholes and open channels and dispose at an approved site within 1000m distance	m³	25.00		
B2.3	SANS	Location of existing services:				
B2.3.1	PSD 8.3.8.1	Excavate by hand and where instructed by the Employer's Agent in soft material to expose existing services	m³	25.00		
B2.4		Cleaning of existing pipework:				
	PSCE1.3a	Cleaning, clearing, unblocking and removal of all silt, sand, sludge, roots and other debris by means of high pressure water jetting equipment (if required hand rodding) and machinery of sewer pipelines from Ø 100 mm to Ø 450 mm, manholes and affected surrounding areas and deposit this material at the official municipal disposal sites:				
B2.4.1		a) 160 mm Ø sewer pipeline	m	1 100.00		
B2.4.2		b) 200 mm Ø sewer pipeline	m	290.00		
B2.4.3		c) 250 mm Ø sewer pipeline	m	25.00		
B2.5		Pipework:				
	SANS 1200 LD 8.2.1	Supply, lay, joint, bed and test for flexible pipes uPVC Maincore 400kPa hoop stiffness pipes with Z-lock or similar approved sewer couplings:				
B2.5.1		a) 160 mm Ø sewer pipeline	m	60.00		
B2.5.2		b) 200 mm Ø sewer pipeline	m	30.00		
B2.5.3		c) 250 mm Ø sewer pipeline	m	390.00		
		Manufacture, supply, store and install new steel pipes				
		Materials: a) Fabrication according to SANS 719: 1971 Grade B with 1600kPa working pressure (4.5mm thickness) b) Sand blasted according to SA055900 SIS2 1/2 Finish c) Hot dop galvanized				
B2.5.4		a) 300mm	m	40.00		
		Specials (Including all flanges)				
		PVC pipe to steel pipe coupling (spigot and socket to flange), including bolts, nuts and gasket				
B2.5.5		a) 300mm	No	2.00		
TOTAL CARRIED FORWARD						



SCHEDULE B- CIVIL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
B2.6		Manholes				
	PSLD 8.2.3	Construct Precast concrete manholes (Ø 750 mm). Complete with heavy duty concrete cover and frame and step irons for depths:				
B2.6.1		0.5 m up to 1.0 m	No	3.00		
B2.6.2		1.0 m up to 1.5 m	No	3.00		
B2.6.3		1.5 m up to 2.0 m	No	5.00		
B2.6.4	PSLD 8.2.12	Raising of existing Ø750mm manholes to 500mm above natural ground level	No	2.00		
B2.6.5	PSLD 8.2.12	Raising of existing Ø1 000mm manholes to 500mm above natural ground level	No	2.00		
B2.7	SANS	Earthworks (pipe trenches):				
	PSDB 8.3.	Excavate for restricted foundations, footings and pipe trenches in all materials and use for backfill or embankment or dispose				
		For pipe diameters from 100 up to and including 300mm:				
B2.7.1		Up to 1.5 m in depth	m	160.00		
B2.7.2		Over 1.5 m up to 2.0 m in depth	m	40.00		
B2.7.3	PSDB	Extra over for item B2.5.2				
B2.7.3.1		Hard rock excavation	m³	20.00		
B2.7.4		Excavate and dispose of unsuitable material from trench bottom	m³	20.00		
	8.3.3	Excavation ancillaries:				
B2.8.1		From other necessary excavations on site	m³	15.00		
B2.8.2		By importation from commercial or off-site sources selected by the Contractor and approved by the Employer's Agent	m³	15.00		
B2.9	SANS	Bedding (pipes):				
	PSLB 8.2.2	Provision of bedding from commercial sources:				
B2.9.1		Selected granular material	m³	75.00		
B2.9.2		Selected fill material	m³	150.00		
TOTAL CARRIED FORWARD						



SCHEDULE B- CIVIL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
B3		SECTION B3 - PUMP STATION				
B3.1		Empty and clean existing structures (building)				
B3.1.1		Remove liquids from structures after treatment of stagnant effluent	m³	110.00		
B3.1.2		Remove grit/sludge from structures and dispose at sludge drying beds	m³	15.00		
B3.1.3		Clean (with high pressure water-jet Min. 250 bar inside) of pump station to remove all dirt, sludge, other contaminants	m²	100.00		
B3.2		Empty and clean existing structures (sumps)				
B3.2.1		Remove liquids from structures after treatment of stagnant effluent	m³	35.00		
B3.2.2		Remove grit/sludge from structures and dispose at sludge drying beds	m³	15.00		
B3.2.3		Clean (with high pressure water-jet Min. 250 bar inside) of sumps to remove all dirt, sludge, other contaminants	m²	160.00		
TOTAL CARRIED FORWARD						





SCHEDULE C - MECHANICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
C2	MPS01	SECTION C2 - OXIDATION PUMP STATION				
C2.1		Oxidation Pump Sets				
C2.1.1		Prepare a GA drawing of the Oxidation Pump Sets, include measuring of actual site dimensions.	sum	1.00		
C2.1.2		Supply, manufacture, store and deliver on site the Oxidation Pump Sets complete with Motor, Pump, Base plate and Coupling. (KSB KWP or Similar approved)	each	2.00		
C2.1.3		Supply, manufacture, store and deliver on site the Oxidation Pump Sets 100NB PN16 Flanged Suction pipe work complete.	each	2.00		
C2.1.4		Supply, manufacture, store and deliver on site the Oxidation Pump Station 100NB PN16. Flanged Delivery Common Manifold complete up to Connection point with Pipe Support/s.	sum	1.00		
C2.1.5		Supply, manufacture, store and deliver on site the Oxidation Pump Station. 100DN PN16 Isolation valves RSV, for both Suction and Delivery pipework	each	4.00		
C2.1.6		Supply, manufacture, store and deliver on site the Oxidation Pump . 100DN PN16 Ball Type Non Return Valve.	each	2.00		
C2.1.7		Supply, store and deliver on site the Diaphragm Seal with Vacuum Pressure Gauge	each	2.00		
C2.1.8		Supply, store and deliver on site the Diaphragm Seal with Pressure Gauge	each	2.00		
C2.1.9		Install the Oxidation Pump Sets complete with Pipework and ancillary equipment.	sum	1.00		
C2.1.10		Commission and up-hold the Oxidation Pump Set, Pipework and ancillary equipment for 12 months retention period.	sum	1.00		
C2.1.11		Allowance to remove existing pump sets and transport to KSB Pumps & Valves, Germiston, Gauteng to check that like for like Pump Set is replaced	PC Sum	2.00		
		Equipment Specification				
		TYPE: Centrifugal non-clogging pump (KSB KWP-F 50-200 or PUMP DUTY: Head (max) = 11.8 [m] (@ Q = 0), Flow (max) = 85 [m3/h] (H = 6 [m]) SUCTION PIPE WORK: Steel, 100NB, PN16, Hot-Dip Galvanized (HDG) DELIVERY PIPE WORK: Steel, 100NB, PN16, Hot-Dip Galvanized (HDG) ISOLATION VALVES: 100DN PN16 Isolation valves RSV (AVK or Similar approved) NON-RETURN VALVES: 100DN PN16 Ball-Type Non-Return valves (AVK or Similar approved) PIPE WORK: All pipe work flanged and pipe supports where required. COMPOSITION & MATERIAL: - Pipe work: Steel, Hot-Dip Galvanized (HDG) - Pump Set: Cast Iron ; Impeller: Mat JL 1040 ; Shaft Sleeve: 316 St Steel - Pipe supports: S355JR, Hot-Dip Galvanized (HDG) - Fixing bolts: Grade 8.8 Hot-Dip Galvanized (HDG)				
TOTAL CARRIED FORWARD						



SCHEDULE C - MECHANICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
C3	MPS02	SECTION C3 - BIOFILTER RECIRCULATION PUMP STATION				
C3.1		Biofilter Recirculation Pump Sets				
C3.1.1		Prepare a GA drawing of the Biofilter Recirculation Pump Sets, include measuring of actual site dimensions.	sum	1.00		
C3.1.2		Supply, manufacture, store and deliver on site the Biofilter Recirculation Pump Sets complete with Motor, Pump, Base plate and Coupling. (KSB KWP or Similar approved)	each	2.00		
C3.1.3		Supply, manufacture, store and deliver on site the Biofilter Recirculation Pump Sets 150NB PN16 Flanged Suction pipe work complete.	each	2.00		
C3.1.4		Supply, manufacture, store and deliver on site the Biofilter Recirculation Pump Station 150NB PN16. Flanged Delivery Common Manifold complete up to Connection point with Pipe Support/s.	sum	1.00		
C3.1.5		Supply, manufacture, store and deliver on site the Biofilter Recirculation Pump Station. 150DN PN16 Isolation valves RSV, for both Suction and Delivery pipework	each	4.00		
C3.1.6		Supply, manufacture, store and deliver on site the Biofilter Recirculation Pump Station. 150DN PN16 Ball Type Non Return Valve.	each	2.00		
C3.1.7		Supply, store and deliver on site the Diaphragm Seal with Vacuum Pressure Gauge	each	2.00		
C3.1.8		Supply, store and deliver on site the Diaphragm Seal with Pressure Gauge	each	2.00		
C3.1.9		Install the Biofilter Recirculation Pump Sets complete with Pipework and ancillary equipment.	sum	1.00		
C3.1.10		Commission and up-hold the Biofilter Recirculation Pump Set, Pipework and ancillary equipment for 12 months retention period.	sum	1.00		
C3.1.11		Allowance to remove existing pump sets and transport to KSB Pumps & Valves, Germiston, Gauteng to check that like for like Pump Set is replaced	PC Sum	2.00		
		Equipment Specification				
		TYPE: Centrifugal non-clogging pump (KSB KWP-F 80-250 or Similar approved) PUMP DUTY: Head (max) = 12.6 [m] (@ Q = 0), Flow (max) = 170 [m3/h] (H = 6.3 [m]) SUCTION PIPE WORK: Steel, 150NB, PN16, Hot-Dip Galvanized (HDG) DELIVERY PIPE WORK: Steel, 150NB, PN16, Hot-Dip Galvanized (HDG) ISOLATION VALVES: 150DN PN16 Isolation valves RSV (AVK or Similar approved) NON-RETURN VALVES: 150DN PN16 Ball-Type Non-Return valves (AVK or Similar approved) PIPE WORK: All pipe work flanged and pipe supports where required. COMPOSITION & MATERIAL: - Pipe work: Steel, Hot-Dip Galvanized (HDG) - Pump Set: Cast Iron ; Impeller: Mat JL 1040 ; Shaft Sleeve: 316 St Steel - Pipe supports: S355JR, Hot-Dip Galvanized (HDG) - Fixing bolts: Grade 8.8 Hot-Dip Galvanized (HDG)				
TOTAL CARRIED FORWARD						



SCHEDULE C - MECHANICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
C4	MPS03	SECTION C4 - SLUDGE RECIRCULATION HUMUS PUMP				
C4.1		Sludge Recirculation Humus Pump Sets				
C4.1.1		Prepare a GA drawing of the Sludge Recirculation Pump Sets, include measuring of actual site dimensions.	sum	1.00		
C4.1.2		Supply, manufacture, store and deliver on site the Sludge Recirculation Pump Sets complete with Motor, Pump, Base plate and Coupling. (KSB KWP or Similar approved)	each	2.00		
C4.1.3		Supply, manufacture, store and deliver on site the Sludge Recirculation Pump Sets 150NB PN16 Flanged Suction pipe work complete.	each	2.00		
C4.1.4		Supply, manufacture, store and deliver on site the Sludge Recirculation Pump Station 150NB PN16. Flanged Delivery Common Manifold complete up to Connection point with Pipe Support/s.	sum	1.00		
C4.1.5		Supply, manufacture, store and deliver on site the Sludge Recirculation Pump Station. 150DN PN16 Isolation valves RSV, for both Suction and Delivery pipework	each	4.00		
C4.1.6		Supply, manufacture, store and deliver on site the Sludge	each	2.00		
C4.1.7		Supply, store and deliver on site the Diaphragm Seal with Vacuum Pressure Gauge	each	2.00		
C4.1.8		Supply, store and deliver on site the Diaphragm Seal with Pressure Gauge	each	2.00		
C4.1.9		Install the Sludge Recirculation Pump Sets complete with Pipework and ancillary equipment.	sum	1.00		
C4.1.10		Commission and up-hold the Sludge Recirculation Pump Set,	sum	1.00		
C4.1.11		Allowance to remove existing pump sets and transport to KSB	PC Sum	2.00		
		Equipment Specification				
		TYPE: Centrifugal non-clogging pump (KSB KWP-F 80-250 or Similar approved) PUMP DUTY: Head (max) = 10.3 [m] (@ Q = 0), Flow (max) = 150 [m3/h] (H = 4.2 [m]) SUCTION PIPE WORK: Steel, 150NB, PN16, Hot-Dip Galvanized (HDG) DELIVERY PIPE WORK: Steel, 150NB, PN16, Hot-Dip Galvanized (HDG) ISOLATION VALVES: 150DN PN16 Isolation valves RSV (AVK or Similar approved) NON-RETURN VALVES: 150DN PN16 Ball-Type Non-Return valves (AVK or Similar approved) PIPE WORK: All pipe work flanged and pipe supports where required. COMPOSITION & MATERIAL: - Pipe work: Steel, Hot-Dip Galvanized (HDG) - Pump Set: Cast Iron ; Impeller: Mat JL 1040 ; Shaft Sleeve: 316 St Steel - Pipe supports: S355JR, Hot-Dip Galvanized (HDG) - Fixing bolts: Grade 8.8 Hot-Dip Galvanized (HDG)				
TOTAL CARRIED FORWARD						



SCHEDULE C - MECHANICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
C5	MPS04	SECTION C5 - WASTE SLUDGE HUMUS PUMP STATION				
C5.1		Waste Sludge Humus Pump Sets				
C5.1.1		Prepare a GA drawing of the Waste Sludge Pump Sets, include measuring of actual site dimensions.	sum	1.00		
C5.1.2		Supply, manufacture, store and deliver on site the Waste Sludge Pump Sets complete with Motor, Pump, Base plate and Coupling. (KSB KWP or Similar approved)	each	2.00		
C5.1.3		Supply, manufacture, store and deliver on site the Waste Sludge	each	2.00		
C5.1.4		Supply, manufacture, store and deliver on site the Waste Sludge Pump Station 100NB PN16 Flanged Delivery Common Manifold complete up to Connection point with Pipe Support/s.	sum	1.00		
C5.1.5		Supply, manufacture, store and deliver on site the Waste Sludge Pump Station 100DN PN16 Isolation valves RSV, for both Suction and Delivery pipework	each	4.00		
C5.1.6		Supply, manufacture, store and deliver on site the Waste Sludge Pump Station 100DN PN16 Ball Type Non Return Valve.	each	2.00		
C5.1.7		Supply, store and deliver on site the Diaphragm Seal with Vacuum Pressure Gauge	each	2.00		
C5.1.8		Supply, store and deliver on site the Diaphragm Seal with Pressure Gauge	each	2.00		
C5.1.9		Install the Waste Sludge Pump Sets complete with Pipework and ancillary equipment.	sum	1.00		
C5.1.10		Commission and up-hold the Waste Sludge Pump Set, Pipework and ancillary equipment for 12 months retention period.	sum	1.00		
C5.1.11		Allowance to remove existing pump sets and transport to KSB Pumps & Valves, Germiston, Gauteng to check that like for like Pump Set is replaced	PC Sum	2.00	15 000.00	30 000.00
		Equipment Specification				
		TYPE: Centrifugal non-clogging pump (KSB KWP-F 50-160 or Similar approved) PUMP DUTY: Head (max) = 8.4 [m] (@ Q = 0), Flow (max) = 65 [m3/h] (H = 4.9 [m]) SUCTION PIPE WORK: Steel, 100NB, PN16, Hot-Dip Galvanized (HDG) DELIVERY PIPE WORK: Steel, 100NB, PN16, Hot-Dip Galvanized ISOLATION VALVES: 100DN PN16 Isolation valves RSV (AVK or Similar approved) NON-RETURN VALVES: 100DN PN16 Ball-Type Non-Return valves (AVK or Similar approved) PIPE WORK: All pipe work flanged and pipe supports where required. COMPOSITION & MATERIAL: - Pipe work: Steel, Hot-Dip Galvanized (HDG) - Pump Set: Cast Iron ; Impeller: Mat JL 1040 ; Shaft Sleeve: 316 St Steel - Pipe supports: S355JR, Hot-Dip Galvanized (HDG) - Fixing bolts: Grade 8.8 Hot-Dip Galvanized (HDG)				
TOTAL CARRIED FORWARD						



SCHEDULE C - MECHANICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
C6		SECTION C6 - AIR SCOUR BLOWERS				
C6.1	MPS06	Submersible Sump Pump				
C6.1.1		Supply, manufacture, store, deliver and install on site the Submersible Sump Pump for the Pump Station Building, including Discharge Pump Work and Float Switch. (Grundfos or similar approved) Duty Point: 3 [l/s] @ 4 [m]	each	1.00		
C6.2		Lifting Equipment				
C6.2.1		Supply, manufacture, store, deliver and install on site a 1 ton manual mechanical trolley and hoist assembly with adequate chain length to access and remove all pump sets. The mechanical trolley should fit the existing installed I-Beams located inside of the Pump Station.	each	2.00		
C6.2.2		Engage an accredited independent third-party contractor to conduct a comprehensive inspection of the installed I-Beams. The inspection shall assess the structural integrity and compliance with design specifications. Upon completion, the contractor shall issue a Safe Working Load (SWL) certificate for the I-Beams. All costs associated with the inspection and certification are to be included.	sum	1.00		
TOTAL CARRIED FORWARD						



SCHEDULE C - MECHANICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
C7	MPS07	SECTION C7 -DISINFECTION				
C7.1	MPS07.1	Sodium Hypochlorite Dosing System				
C7.1.1		Prepare a GA drawing of the Sodium Hypochlorite Dosing System,	sum	1.00		
C7.1.2		Supply, manufacture, store and deliver on site the Chemical Dosing Skid Open bundled 10mm thick Polypropylene dosing skid with floor Stand suitable for 2 Dosing Pumps 1 Duty \ 1 Standby, Y-Type Strainer, PVC Pipes, multifunction valve on each dosing pump (Pressure relief, backpressure) 1L Calibration tube, pressure gauge with chemical seal bladder.	sum	1.00		
C7.1.3		Supply, manufacture, store and deliver on site the Chemical Dosing Pump Duty/Standby. (Grundfos DDC 6-10 or Similar approved)	each	2.00		
C7.1.4		Supply, manufacture, store and deliver on site the 2 500L Vertical Storage Tank SG1.6.	each	2.00		
C7.1.5		Supply, manufacture, store and deliver on site the Sodium Hypochlorite Dosing Filling Line to 2 500L Storage Tanks	sum	1.00		
C7.1.6		Supply, manufacture, store and deliver on site the Sodium Hypochlorite Chemical Line from 2 500L Tanks to Dosing Skid and from Dosing Skid to Contact Channel.	sum	1.00		
C7.1.7		Supply, manufacture, store and deliver on site the 5 Ton Sodium Hypochlorite.	sum	1.00		
C7.1.8		Install the Sodium Hypochlorite Dosing System.	sum	1.00		
C7.1.9		Commission and up-hold the Sodium Hypochlorite Dosing System for 12 months retention period.	sum	1.00		
		Equipment Specification				
		PUMP TYPE: Diaphragm dosing pump (Grundfos DDC 6-10 or Similar approved)				
		PUMP DUTY: Head = 10 [m] (Total Dynamic Head), Flow = 6.0 [l/h]				
		CHEMICAL: Sodium Hypochlorite 12.5 [%].				
		DOSING SKID: Polypropylene Dosing Skid with Stand suitable for 2 Dosing Pumps				
		TANK: 2 500 L Vertical Storage Tank SG1.6 (JoJo or Similar approved)				
		PIPE WORK: All pipe work PVC Class 12 and solvent weld fittings				
C7.2	MPS07.2	Ultrasonic Flow Meter				
		Prepare a GA drawing of the Overflow Weir, including measuring of actual site dimensions.	sum	1.00		
		Supply, manufacture, store and deliver on site the Overflow Weir at Contact Channel.	sum	1.00		
		Supply, manufacture, store and deliver on site the Ultrasonic Flow	sum	1.00		
		Install the Overflow Weir and Ultrasonic Flow Meter.	sum	1.00		
		Commission and up-hold the Overflow Weir and Ultrasonic Flow	sum	1.00		
TOTAL CARRIED FORWARD						



SCHEDULE D - ELECTRICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
D3	EPS02	SCHEDULE D3 - WWTW MAIN MCC				
D3.1		Description				
		The WWTW Main MCC will distribute all power to the equipment at the WWTW The WWTW Main MCC will be installed inside the Pump Station Building at the plant.				
D3.2		WWTW Main MCC Panel				
D3.2.1		Prepare the G.A. Drawings, Schematic and Single-Line Diagrams, and Load List for the MDB MCC Panel with PLC and HMI	sum	1.00		
D3.2.2		Supply, manufacture, store and deliver on site the Main MCC Panel with PLC and HMI	sum	1.00		
		Main incomer Protection, Surge arresters, OUV, Phase Failure, CT Power Supply to Inlet Works MCC Power Supply to Disinfection MCC Clarifier Bridge No.1 (DOL) Clarifier Bridge No.2 (DOL) Irrigation Pump No.1 (Soft Starter) Irrigation Pump No.2 (Soft Starter) Oxidation Pump No.1 (DOL) Oxidation Pump No.2 (DOL) Biofilter Pump No.1 (VSD) Biofilter Pump No.2 (VSD) Humus Sludge Recirculation Pump No.1 (VSD) Humus Sludge Recirculation Pump No.2 (VSD) Humus Waste Sludge Pump No.1 (VSD) Humus Waste Sludge Pump No.2 (VSD) Sump Drainage Pump (DOL) Air Scour Blower No.1 (DOL) Air Scour Blower No.2 (DOL) Local DB No.1				
D3.2.3		Erect / install and terminate the WWTW Main MCC Panel.	sum	1.00		
D3.2.4		Test and Commission the WWTW Main MCC Panel.	sum	1.00		
		Equipment Specification				
		Enclosure - IP 54 - 1.6mm Mild Steel Powder Coated B26 - 1.6mm Mild Steel Inner Door Split into 2 Powder Coated White - 2mm Aluzinc Removable Chassis Powder White - Die Cast 3 Point Locking. Switchgear - Siemens, ABB, Hager, Schneider or Similar approved Variable Speed Drive (VSD) - WEG, Delta, Schneider or Similar approved NOTE: Panels must include approved earthing and total power correction equipment.				
TOTAL CARRIED FORWARD						



SCHEDULE D - ELECTRICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
D4	EPS03	SCHEDULE D4 - WWTW DISINFECTION MCC				
D4.1		Description				
		The WWTW DISINFECTION MCC will distribute power to the Disinfection Equipment The WWTW DISINFECTION MCC will be installed inside the Disinfection Building				
D4.2		WWTW Disinfection MCC Panel				
D4.2.1		Prepare the G.A. Drawings, Schematic and Single-Line Diagrams, and Load List for the MDB MCC Panel	sum	1.00		
D4.2.2		Supply, manufacture, store and deliver on site the Disinfection MCC Panel	sum	1.00		
		Main incomer Protection, Surge arresters, OUVF and Phase Failure Disinfection - Dosing Pump No.1 (DOL) Disinfection - Dosing Pump No.2 (DOL) Contact Channel - Ultrasonic Flow Meter Local DB No.3				
D4.2.3		Erect / install and terminate the WWTW Disinfection MCC Panel.	sum	1.00		
D4.2.4		Test and Commission the WWTW Disinfection MCC Panel.	sum	1.00		
		Equipment Specification				
		Enclosure - IP 54 - 1.6mm Mild Steel Powder Coated B26 - 1.6mm Mild Steel Inner Door Split into 2 Powder Coated White - 2mm Aluzinc Removable Chassis Powder White - Die Cast 3 Point Locking.				
		Switchgear - Siemens, ABB, Hager, Schneider or Similar approved				
		NOTE!: Panels must include approved earthing and total power correction equipment.				
TOTAL CARRIED FORWARD						



SCHEDULE D - ELECTRICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
D5	EPS12	SCHEDULE D5 - WWTW CABLES				
D5.1		Cable Supply				
D5.2		Prepare the Cable Route and Layout Drawing(s) and Cable Schedules, Include measuring and actual site dimensions.	sum	1.00		
D5.3		Supply, store and deliver on site all Cables including all accessories and cable trays where required				
D5.3.1		Transformer Panel to Generator	m	800.00		
D5.3.2		Bare copper earth wire	m	400.00		
D5.3.3		Main MCC to Oxidation Pump No.1 (DOL)	m	50.00		
D5.3.4		Main MCC to Oxidation Pump No.2 (DOL)	m	55.00		
D5.3.5		Main MCC to Oxidation Pumps E-Stop Cables	m	105.00		
D5.3.6		Main MCC to Oxidation Pumps Common Discharge Pressure Transmitter	m	60.00		
D5.3.7		Bare copper earth wire	m	125.00		
D5.3.8		Main MCC to Biofilter Recirculation Pump No.1 (VSD)	m	45.00		
D5.3.9		Main MCC to Biofilter Recirculation Pump No.2 (VSD)	m	50.00		
D5.3.10		Main MCC to Biofilter Recirculation Pumps E-Stop Cables	m	95.00		
D5.3.11		Main MCC to Biofilter Recirculation Pumps Common Discharge Pressure Transmitter	m	55.00		
D5.3.12		Bare copper earth wire	m	95.00		
D5.3.13		Main MCC to Humus Sludge Recirculation Pump No.1 (VSD)	m	30.00		
D5.3.14		Main MCC to Humus Sludge Recirculation Pump No.2 (VSD)	m	35.00		
D5.3.15		Main MCC to Humus Sludge Recirculation Pumps E-Stop Cables	m	65.00		
D5.3.16		Main MCC to Humus Sludge Recirculation Pumps Common Discharge Pressure Transmitter	m	40.00		
D5.3.17		Bare copper earth wire	m	65.00		
D5.3.18		Main MCC to Humus Waste Sludge Pump No.1 (VSD)	m	25.00		
D5.3.19		Main MCC to Humus Waste Sludge Pump No.2 (VSD)	m	30.00		
TOTAL CARRIED FORWARD						



SCHEDULE D - ELECTRICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
D5.3.20		Main MCC to Humus Waste Sludge Pumps E-Stop Cables	m	55.00		
D5.3.21		Main MCC to Humus Waste Sludge Pumps Common Discharge Pressure Transmitter	m	35.00		
D5.3.22		Bare copper earth wire	m	55.00		
D5.3.23		Main MCC to Air Scour Blower No. 01 (DOL)	m	10.00		
D5.3.24		Main MCC to Air Scour Blower No. 02 (DOL)	m	10.00		
D5.3.25		Main MCC to Humus Waste Sludge Pumps E-Stop Cables	m	20.00		
D5.3.26		Bare copper earth wire	m	20.00		
D5.3.27		Main MCC to Sump Drainage Pump (DOL)	m	30.00		
D5.3.28		Main MCC to Sump Drainage Pump Level Probe	m	30.00		
D5.3.29		Main MCC to Alarm for Emergency High Level in Sump	m	5.00		
D5.3.30		Bare copper earth wire	m	30.00		
D5.3.31		Main MCC to Disinfection MCC	m	250.00		
D5.3.32		Disinfection MCC to Dosing Pump No.1 (DOL)	m	15.00		
D5.3.33		Disinfection MCC to Dosing Pump No.2 (DOL)	m	15.00		
D5.3.34		Disinfection MCC to Contact Channel Ultrasonic Flow Meter	m	50.00		
D5.3.35		Disinfection MCC to Contact Channel Ultrasonic Flow Meter signal cable	m	50.00		
D5.3.36		Bare copper earth wire	m	250.00		
D5.3.37		Main MCC to Clarifier Bridge No.1 (DOL)	m	40.00		
D5.3.38		Main MCC to Clarifier Bridge No.2 (DOL)	m	60.00		
D5.3.39		Main MCC to Clarifier Bridge No.1 & No.2 E-Stop Cables	m	100.00		
D5.3.40		Bare copper earth wire	m	100.00		
D5.3.41		Main MCC to Local Power at Pump Station DB No.1	m	20.00		
D5.3.42		Inlet MCC to Local Power at Control Room Building DB No.2	m	20.00		
D5.3.43		Disinfection MCC to Local Power at Disinfection Building DB No.3	m	20.00		
D5.3.44		Bare copper earth wire	m	60.00		
TOTAL CARRIED FORWARD						



SCHEDULE D - ELECTRICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
D6		SCHEDULE D6 - WWTW CABLES INSTALLATION				
D6.1		Cable Installation				
D6.2		Install, Terminate and Commission the Cables listed below				
D6.2.1		Transformer Panel to Generator	m	800.00		
D6.2.2		Bare copper earth wire	m	400.00		
D6.2.3		Main MCC to Oxidation Pump No.1 (DOL)	m	50.00		
D6.2.4		Main MCC to Oxidation Pump No.2 (DOL)	m	55.00		
D6.2.5		Main MCC to Oxidation Pumps E-Stop Cables	m	105.00		
D6.2.6		Main MCC to Oxidation Pumps Common Discharge Pressure Transmitter	m	60.00		
D6.2.7		Bare copper earth wire	m	125.00		
D6.2.8		Main MCC to Biofilter Recirculation Pump No.1 (VSD)	m	45.00		
D6.2.9		Main MCC to Biofilter Recirculation Pump No.2 (VSD)	m	50.00		
D6.2.10		Main MCC to Biofilter Recirculation Pumps E-Stop Cables	m	95.00		
D6.2.11		Main MCC to Biofilter Recirculation Pumps Common Discharge Pressure Transmitter	m	55.00		
D6.2.12		Bare copper earth wire	m	95.00		
D6.2.13		Main MCC to Humus Sludge Recirculation Pump No.1 (VSD)	m	30.00		
D6.2.14		Main MCC to Humus Sludge Recirculation Pump No.2 (VSD)	m	35.00		
D6.2.15		Main MCC to Humus Sludge Recirculation Pumps E-Stop Cables	m	65.00		
D6.2.16		Main MCC to Humus Sludge Recirculation Pumps Common Discharge Pressure Transmitter	m	40.00		
D6.2.17		Bare copper earth wire	m	65.00		
D6.2.18		Main MCC to Humus Waste Sludge Pump No.1 (VSD)	m	25.00		
D6.2.19		Main MCC to Humus Waste Sludge Pump No.2 (VSD)	m	30.00		
D6.2.20		Main MCC to Humus Waste Sludge Pumps E-Stop Cables	m	55.00		
TOTAL CARRIED FORWARD						



SCHEDULE D - ELECTRICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
D6.2.21		Main MCC to Humus Waste Sludge Pumps Common Discharge Pressure Transmitter	m	35.00		
D6.2.22		Bare copper earth wire	m	55.00		
D6.2.23		Main MCC to Air Scour Blower No. 01 (DOL)	m	10.00		
D6.2.24		Main MCC to Air Scour Blower No. 02 (DOL)	m	10.00		
D6.2.25		Main MCC to Humus Waste Sludge Pumps E-Stop Cables	m	20.00		
D6.2.26		Bare copper earth wire	m	20.00		
D6.2.27		Main MCC to Sump Drainage Pump (DOL)	m	30.00		
D6.2.28		Main MCC to Sump Drainage Pump Level Probe	m	30.00		
D6.2.29		Main MCC to Alarm for Emergency High Level in Sump	m	5.00		
D6.2.30		Bare copper earth wire	m	30.00		
D6.2.31		Main MCC to Disinfection MCC	m	250.00		
D6.2.32		Disinfection MCC to Dosing Pump No.1 (DOL)	m	15.00		
D6.2.33		Disinfection MCC to Dosing Pump No.2 (DOL)	m	15.00		
D6.2.34		Disinfection MCC to Contact Channel Ultrasonic Flow Meter	m	50.00		
D6.2.35		Disinfection MCC to Contact Channel Ultrasonic Flow Meter signal cable	m	50.00		
D6.2.36		Bare copper earth wire	m	250.00		
D6.2.37		Main MCC to Clarifier Bridge No.1 (DOL)	m	40.00		
D6.2.38		Main MCC to Clarifier Bridge No.2 (DOL)	m	60.00		
D6.2.39		Main MCC to Clarifier Bridge No.1 & No.2 E-Stop Cables	m	100.00		
D6.2.40		Bare copper earth wire	m	100.00		
D6.2.41		Main MCC to Local Power at Pump Station DB No.1	m	20.00		
D6.2.42		Inlet MCC to Local Power at Control Room Building DB No.2	m	20.00		
D6.2.43		Disinfection MCC to Local Power at Disinfection Building DB No.3	m	20.00		
D6.2.44		Bare copper earth wire	m	60.00		
D6.2.45		Test and Commission the WWTW Cables.	sum	1.00		
TOTAL CARRIED FORWARD						



SCHEDULE D - ELECTRICAL WORKS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
TOTAL BROUGHT FORWARD						
D7		SCHEDULE D7 - ELECTRICAL SUNDRIES				
D7.1		Local DB				
D7.1.1		Manufacture, supply, store and deliver the LDB No.1, 2 and 3 with the following Wiring and Cables, Conduits and Trunking, Switches and Sockets, Lighting, Power Outlets Grounding and Bonding Equipment.	each	1.00		
		Pump Station Building DB No.1 Control Room at the Inlet Works DB No.2 Disinfection Building DB No.3				
D7.1.2		Install the LDB No.1, 2 and 3	each	1.00		
D7.1.3		Commission and up-hold the Electrical installation for 12 months retention period.	sum	1.00		
		Equipment Specification - South African National Standards (SANS) 10142-1: The Wiring of Premises				
D7.2		Pressure Transmitters (No Flow Protection)				
D7.2.1		Manufacture, supply, store and deliver the Pressure Transmitter with Diaphragm Seal at the common discharge manifold of all Duty / Standby Pump Sets in the Pump Station building	each	4.00		
D7.2.2		Install the Pressure Transmitters	each	4.00		
D7.2.3		Commission and up-hold the Pressure Transmitters for 12 months retention period.	sum	1.00		
TOTAL CARRIED FORWARD TO SUMMARY PAGE						



SUMMARY OF SCHEDULES	
DESCRIPTION	AMOUNT R
SCHEDULE A - PRELIMINARY AND GENERAL	
SCHEDULE B - CIVIL	
SCHEDULE C - MECHANICAL	
SCHEDULE D - ELECTRICAL	
Sub - Total 1	
10% Contengencies	
Sub - Total 2	
15% VAT	
TOTAL CARRIED FORWARD TO COVER PAGE	



PHUMELELA LOCAL MUNICIPALITY

BID NUMBER : PLMT 24-25/01

**APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT
OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS**

THE CONTRACT: PART C3 **PART 3 (OF 5): SCOPE OF WORKS**

CONTENTS

C3.1	Description of the Works
C3.2	Engineering
C3.3	Procurement
C3.4	Project Specifications
C3.5	Particular Specifications

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C3.1: DESCRIPTION OF WORKS

In the event of any discrepancy between the Scope of Works and a part or parts of the SANS 1200 Standardized Specifications, the Bill of Quantities or the Drawings, the Project Specifications shall take precedence and prevail in the Contract.

C3.1.1 EXTENT OF WORKS

The Project Specifications form an integral part of the contract documentation, and it supplements the Standard Specifications.

The Standard Specifications which form part of this Contract covers work associated with general infrastructure projects, and may therefore cover items not specifically applicable to this particular contract.

The description of the work contained in this section is merely an outline of the Scope of Works, but does not limit the work to be carried out under this Contract. Approximate quantities for each type of activity to be carried out under the Contract are listed in the Schedule of Quantities bound in this volume.

The Vrede WWTW has a treatment capacity of 1,6 Ml/day. The general condition of the civil infrastructure at WWTW is good, some of the components of the Vrede WWTW are not operational and require urgent refurbishment. The intention is to fully refurbish the WWTW to its original functionality and performance.

The successful bidder is to ensure that the WWTW remains operational at all times during construction.

The pricing schedules specify refurbishment and new work and materials to be supplied, constructed, and installed under this contract.

The scope of work can be divided mainly in the unit treatment process as follows:

The refurbishment of the Vrede WWTW include civil, mechanical and electrical works on the following sections:

- Disinfection facility;
- Oxidation ponds;
- Pump station, including pumps, motors and electrical equipment;
- Interconnecting pipe work;
- Fence (new security fence).

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

C3.1.1.1 DISINFECTION FACILITY:



Figure 1: Arial View of Disinfection Facility

The following scope of works are to be completed at this section of the WWTW, but not limited to:

- Remove existing dosing system and replace with a new dosing system as specified
- Install an overflow weir with ultrasonic flow meter at the end of the contract channel

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

C3.1.1.2 OXIDATION PONDS:



Figure 2: Aerial View of Oxidation Ponds

The following scope of works are to be completed at this section of the WWTW, but not limited to:

- Remove liquid from structure after treatment stagnant effluent.
- Remove grit/sludge and vegetation from structure.
- Repair embankments as specified by the Engineer on site.
- Clear and grub oxidation pond floors.
- Apply weed killed or similar approved to the embankments.

The following scope of works to be confirmed once structures is drained and assessed:

- Extent of repairs required on the embankment.
- Extent of repairs required on the pond floors.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

C3.1.1.3 PUMP STATION



Figure 3: Arial View of Pump Station

The following scope of works are to be completed at this section of the WWTW, but not limited to:

- Remove liquid from structure after treatment stagnant effluent.
- Removal of grit/sludge from structure.
- Clean structure to remove dirt, sludge and other contaminants.
- Remove and refurbish/replace existing pumps, except the irrigation pump.
- Remove and replace existing pipe network.
- Remove and replace existing MCC panels and pump-set controls, including associated electrical works.

The following scope of works to be confirmed once structures is drained and assessed:

- Extent of repairs required on the building.
- Extent of mechanical repairs required.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



C3.1.1.4 INTERCONNECTING PIPEWORK

The following scope of works are to be completed at this section of the WWTW, but not limited to:

- Clean existing pipe network where specified by the Engineer.
- Remove and replace interconnecting pipe where specified by the Engineer.
- Install manholes where specified by the Engineer.

C3.1.1.5 FENCING

The following scope of works are to be completed at this section of the WWTW, but not limited to:

- Install a new 2-layer security fence around the pump station and disinfection facility.
- Install a 3-layer security fence gate at the entrance to the pump station and disinfection facility.

All the mechanical equipment is specified to be replaced with new equipment. However, on discretion of the Employer's Agent, specific mechanical equipment can be inspected and only be refurbished instead of replaced.

All the electrical equipment is specified to be replaced with new equipment. However, on discretion of the Employer's Agent, specific electrical can be inspected and only be refurbished instead of replaced.

The refurbishment specification part of this document, discuss in detail the guidelines to ensure the Contractor understand the outcome of the refurbishment tasks.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**C3.1.6 LOCATION OF THE WORKS**

The project is located in Vrede/ Thembalihle, under Phumelela Local Municipality in the Free State Province.

Vrede is situated in the north-eastern Free State about 20km east of the N3, close to the Mpumalanga border. Vrede is 220km from northern Johannesburg and about 30km from Cornelia on the R102 to Warden and Harrismith, on the Volksrust-Newcastle Road.

The WWTW is located 4.2km to the CBD, next to R546 road.

The GPS coordinates of the projects are given in below.

Description	Longitude	Latitude
Vrede WWTW	27° 23' 59" S	29° 10' 52" E

C3.1.7 OVERVIEW OF THE WORKS**a. Construction program**

It is required that the bidder submit a detailed construction program linked to the duration of the project and clearly indicating the key deliverables, time frames and sequence of events.

The Contractor's programme shall include:

- (i) All construction activities with comprehensive and sufficient detail to assess construction progress and manage and control financial issues.
- (ii) It must indicate coherent planning to enable the Employer's Agent to perform required and necessary actions, e.g. to issue notifications, to obtain permissions, etc.
- (iii) Indicate critical path activities and their dependencies
- (iv) Include key flags and dates in respect of work to be carried out by others
- (v) Indicate key dates in respect of information required from others, including the Employer's Agent, local authorities, and other contractors and sub-contractors working in the area.

If any significant change to the critical path occurs, the Contractor shall, as soon as possible, notify the Employer's Agent thereof in writing. If requested in writing by the Employer's Agent a revised construction programme shall be submitted within 7 days.

b. Water and power supply and other services

The Contractor shall make his own arrangement and pay all installation and consumption charges for the supply of water, electrical power and other services required.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



c. Camps and depot

The Contractor shall make his own arrangements with the local authority with regards to the location of a site for his temporary camp for offices, stores, workshops and for accommodation and housing of his personnel.

It is proposed that the site-camp be erected at the WWTW within the perimeter of the fence.

d. Local labour

The Contractor shall endeavour to maximise the employment of local labour.

With the assistance of the Infrastructure Portfolio Committee of the Phumelela Local Municipality and local ward committees, and a Project Steering Committee (PSC) will be established. The PSC will appointment a Community Liaison Officer (CLO) that will be employed by the Contractor for the duration of the Contract.

The CLO will assist the Contractor with local labour issues, including employment conditions, remuneration, performance monitoring, etc.

e. Labour-intensive construction

Preference must be given to labour-intensive construction methods. Items such as restricted excavations, trimming of excavations, trench excavations, excavations for pipeline structures, laying and connecting of pipes, backfilling and similar tasks shall be carried out by hand.

f. Training of local labour

The Contractor shall provide in-service training for labourers recruited from the local community. The training shall cover semi-skilled labour activities such as erection of shuttering, placing of concrete, construction of gabion structures and stone pitching, laying of segmented paving blocks, etc.

The cost of such training will be regarded to have been included in the bid rates for the relevant type of work.

g. Sanitary conditions

Adequate ablution facilities must be provided along the entire extent of the Site of the Works. This includes toilets, hand wash basins, toilet paper, soap, etc. The Contractor must ensure that his personnel and labour force are properly informed and (if necessary) educated about general personal hygiene and the use of ablution facilities. Unhygienic conditions, habits and behaviour that may cause contamination on any part of the Works or surrounding areas are strictly prohibited.

The Contractor shall ensure that sanitary conditions acceptable to the Employer's Agent prevail on site through the contract period, and that all his workers are aware of, and comply with this condition.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



h. Liaison between contractors

The Contractor must liaise with other contractors that may be working in the vicinity or along the extent of the site, and ensure that there is communication and co-operation at all times to avoid any disputes.

This requirement includes issues such as sharing of access roads, borrow areas, storage space, water sources, waste or dumping areas, etc.

C3.1.8 TEMPORARY WORKS

Provisionally the by-pass flow will form part of provisional works.

C3.1.8.1 Other Services (Telecommunications, Electricity, etc.)

The Contractor shall ensure that the position of all existing services affected by the Works have been verified before construction works commences. Should it be necessary to lower or relocate any service, the Contractor will be required to make the necessary arrangements with the relevant service provider and to advise the Employer's Agent accordingly.

C3.1.18.2 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 his 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 Contractor by the Employer's Agent.

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 Employer's Agent 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 as determined on completion of the Works.

C3.1.8.3 Protection of Existing Works

The Contractor shall take all necessary steps to 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. No more than three weeks and not less than one week before commencing his operations in any particular area, the Contractor shall request in writing from the Employer's Agent the latest available drawings showing the location of services already installed. The Contractor will also be responsible for contacting the various service providers, arranging meetings and verifying all known, as well as possibly unknown, services on site.

The Contractor shall take all necessary steps to protect any existing works whatsoever against damage which may arise as a result of his operations on Site. The Contractor shall bear the cost of the repair of damage to any service, the existence of which could reasonably have

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



been ascertained by him in good time. 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 monthly Payment Certificate. The Employer will attend to the payment of monies due to outside authorities, should the Contractor not make direct payment timeously.

C3.1.8.4 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 described in this sub-section.

C3.1.9 CLIENTS'S DESIGN

The permanent works included in this contract has been designed by the Employer's Agent. The detail of the works is indicated on the drawing and in the specifications. The tenderer may submit alternative offers for designs prepared by himself subject to the conditions of the standard specifications.

C3.1.10 CONTRACTOR'S DESIGN

Where the contractor is to supply the design of designated equipment and parts of the permanent Works or temporary Works, he shall supply fill working drawings supported by a professional Employer's Agent's design certificate.

C3.1.11 DRAWINGS

The Employer's Agent will provide the Contractor with available drawings, which will be used exclusively for the recording of as-built information by the Contractor.

Only dimensions, positions, levels, co-ordinates etc. that change from the original values, will be required to be entered on these drawings. These drawings, fully marked up, will be handed to the Employer's Agent at the issue of the Certificate of completion, which will not be issued until the as-built information has been received.

There will be allowance in the quantities for the development of as-built drawings of the existing structures and existing services.

There is also allowance in the quantities for the mechanical and electrical contractor to develop and submit G.A. drawings for approval of all the equipment required under this contract.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



C3.1.12 DESIGN PROCEDURE

Designs shall be concluded by the Employer's Agent and issued to the Contractor on the day of the official site handover. The designs shall be approved by the local authority before construction commences. The contractor shall be liable for capturing all the relevant changes to the design on the as-built drawing, thereafter the drawing shall be submitted to the Employer's Agent for capturing. Under no conditions will the contractor deviate from the issued design unless the Employer's Agent formally approves thereof in writing.

C3.1.13 CONTRACTOR'S DUTIES

The Contractor's duties which include the following duties relating to the Works:

- Design
- Manufacture
- Supply
- Delivery
- Installation and Construction
- Testing
- Commissioning
- Training the Employer's staff in operation and maintenance
- Trial Operation
- Upholding during the Defects Liability Period

The Contractor, where listed, will be obligated to attend to some additional scope of works required by the Employer.

C3.1.14 LABOUR ENHANCED CONSTRUCTION METHODS

C3.1.14.1 General

It is the primary intention of this Contract that where possible, work can be carried out by Labour Enhanced Construction Methods. The adoption of this method of construction will in no way lessen the responsibilities of the Contractor nor will it permit any deviation from the technical specifications of the Works.

Construction shall be planned so that those operations that can reasonably be done by hand shall be done so. The Contractor shall utilize a core of artisans, supervisors and specialist labour to supervise work on site, with the bulk of the labour force being recruited from the local community. The actual persons to be employed shall be done in consultation with the Community Liaison Officer. For labour intensive construction to be successful and feasible, a high degree of community participation must be exercised throughout the process.

C3.1.14.2 Control of Construction

The Contractor shall provide from his own staff, a full-time agent on site to the District Municipality Areas, sufficient skilled foremen in the District Municipality Areas to supervise all aspects of the work and sufficient skilled working charge hands and artisans to carry out the work. The "labour force" shall comprise of residents from the different communities where the work is undertaken.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



C3.2: ENGINEERING

C3.2.1 DESIGN SERVICES AND ACTIVITY MATRIX

Works designed by, per design stage

Concept, feasibility and overall process

Employer's Agent for Employer

Basic engineering and detail layout to tender stage *Employer's Agent for Employer*

Final design to be approved for construction stage *Contractor to be approved by Employer's Agent for Employer*

Temporary works

Contractor

Preparation of as-built drawings

Employer's Agent for Employer

(Contractor to provide as-built information to Employer's Agent)

C3.2.2 EMPLOYER'S DESIGN

All designs will be done by the Employer's Agent responsible for the contract management of the assignment, unless otherwise stated.

C3.2.3 DESIGN BRIEF

The Employers design brief is that all infrastructure is to be designed to comply with the following design standards:

- The design standards as set out in the "Guidelines for Human Settlement Planning and Design" (Red Book)
- Phumelela Local Municipality technical standards and bylaws
- The SANS 1200 series of standardised specifications for civil engineering construction will apply

Designs will be the sole responsibility of the Employer's Agent and must be all acquire the approval of the Employer.

C3.2.4 DRAWINGS

Additional construction drawings will, in terms of Clause 5.9 of the General Conditions of Contract (2015), be issued to the Contractor by the Employer's Agent / Employer on the commencement date and from time to time as required.

A set of drawings are attached to C4.1 – Book of Drawings.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C3.3: PROCUREMENT

C3.3.1 PAYMENT CERTIFICATES DISPUTES

Should there be a dispute between the value of the certificate submitted by the applicable nominated Sub-Contractor, EME or QSE and the value calculated by the Main Contractor, the nominated Sub-Contractor, EME or QSE will be paid the amount determined by the Main Contractor, all still within 14 days.

A meeting with the Mentor, Client's Representative, Main Contractor and appointed Enterprise may then be called to discuss and resolve the differences. The meeting may be held longer that required and the Client's Representative must control the duration of the meeting.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

C3.4: PROJECT SPECIFICATIONS

CONTENT

PART	HEADING	
C3.4.1	PS	CIVIL PROJECT SPECIFICATION
	PB	BUILDING WORK SPECIFICATION
	MPS	MECHANICAL PROJECT SPECIFICATION
	EPS	ELECTRICAL PROJECT SPECIFICATION
	MESS	MECHANICAL AND ELECTRICAL SERVICE SPECIFICATION
	RS	REFURBISHMENT SPECIFICATION

 Contractor

 Witness 1

 Witness 2

 Employer

 Witness 1

 Witness 2



C3.4.1: CIVIL PROJECT SPECIFICATIONS

C3.4.1 APPLICABLE SANS 2001 OR SANS 1200 STANDARDS FOR CONSTRUCTION WORKS

Where reference is made to the standard specifications in the contract document, it shall mean the Standardization Specifications for Civil Engineering Construction (SANS 1200), as published by the South African Bureau of Standards.

The Standard Specifications might not cover all the different types of work included in the Contract. The general requirements for portions of the Works not covered by the Standard Specifications are described in the *Particular Specifications* under section C.3.4.3.

The clauses under section C.3.4.3 are numbered "PS" followed by a letter and a number corresponding to the number of the relevant clause in the Standard Specifications. New clauses not covered by clauses in the Standard Specifications, if included here, are also designated "PS" followed by a letter and a number. These numbers follow on the last clause number used in the relevant sections of the Standard Specifications.

C3.4.2 APPLICABLE NATIONAL AND INTERNATIONAL STANDARDS

For the purpose of this Contract, the latest issues of the following Standard Specifications for Civil Engineering Construction, applicable at the date of tender advertisement, shall apply.

CIVIL AND STRUCTURAL ENGINEERING

SANS 1200 A	:	General
SANS 1200 AB	:	Employer's Agent's Office
SANS 1200 C	:	Site Clearance
SANS 1200 D	:	Earthworks
SANS 1200 DB	:	Earthworks (Pipe trenches)
SANS 1200 DM	:	Earthworks (Roads, subgrade)
SANS 1200 G	:	Concrete (Structural)
SANS 1200 GA	:	Concrete (Small Works)
SANS 1200 GB	:	Concrete (Ordinary building)
SANS 1200 HA	:	Structural steelwork
SANS 1200 HB	:	Cladding and sheeting
SANS 1200 L	:	Medium Pressure Pipelines
SANS 1200 LB	:	Bedding (Pipes)
SANS 1200 LD	:	Sewers
SANS 1200 LK	:	Manufacture and supply of valves
SANS 1200 MJ	:	Segmented paving
SANS 1200 MK	:	Kerbing and Channelling
SANS 1200 CE	:	Cleaning equipment
SANS 1200 CI	:	Camera Inspection

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C3.4.3 PARTICULAR SPECIFICATIONS RELATING TO STANDARD SPECIFICATIONS

Should any requirement of section C.3.4.3 conflict with any requirement of the Standardised Specifications then the requirements of section C.3.4.3 shall prevail.

The term "project specifications" appearing in any of the SANS 1200 Standardised Specifications must be replaced with the terms "scope of work".

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSA GENERAL (SANS 1200A)****PSA 3 MATERIALS****PSA 3.1 Quality**

All materials to be used for the completion of the works must comply with the applicable standards and requirements of the South African Bureau of Standards or SANS, and bear the SABS/SANS quality mark.

The contractor must compile a full quality assurance plan and submit it to the Employer for approval before construction commences.

The plan must include the following:

- Setting out of works
- Construction programme
- Laying of pipes to lines and levels
- Bedding and backfilling to specifications
- Compaction to specifications
- Testing of pipelines
- Quality of sand and stone for concrete
- Method and control over accurate batching of concrete
- Fixing of reinforcing and control over cover
- Curing of concrete
- Concrete cube test
- Quality and accuracy of shuttering within the specified tolerances
- Competencies of staff responsible for day-to-day quality assurance

The Contractor will be required to keep full records of the results of his quality assurance programme on site.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSA 5 CONSTRUCTION****PSA 5.4 Protection of overhead and underground services**

Replace the heading and contents of Sub-clause 5.4 with the following:

“PSC 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 contact and notify the following service providers:

1	Telkom	Mr S Rampeta	058 713 3550 / 081 401 5158
2	Eskom	Mr L Mofokeng	079 584 5999
3	Department of Roads and Police	Mrs B Manco	066 473 2677 / 078 956 3075

Before commencing with any work in an area, the Contractor shall ascertain the presence and actual position of all services which 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 his 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 he intends to work. Neither the Employer nor the Employer's Agent offers 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.

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 1200 D (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 when any such service is encountered or discovered on the Site.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Whilst he 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 cognizance being taken of such deviations in line and level which may reasonably be anticipated, and
- (b) any other service which ought reasonably to have been a known service in accordance with the provisions of this clause.

The Contractor shall also be liable for consequential damage in regard to (a) and (b), whether caused directly by the Contractor's operations or by the lack of proper protection.

No separate payment will be made to the Contractor in respect of his 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. These costs shall be deemed included in the Contractor's other BID rates and prices included in the Contract.

Payment to the Contractor 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 for in the respective sections of the specifications pertaining to the type of work involved.

PSA 5.4.2 Protection during construction

The Contractor shall take all reasonable precautions and arrange its operations in such a manner as to prevent damage occurring to all known services during the period which the Contractor has occupation and/or possession of the Site.

Services left exposed shall be suitably protected from damage and in such a manner as will eliminate any danger arising therefrom to the public and/or workmen, all in accordance with the requirements of the prevailing legislation and related regulations.

Unless otherwise instructed by the Employer's Agent, no services shall be left exposed after its exact position has been determined and all excavations carried out for the purpose of exposing underground services shall be promptly backfilled and compacted. In roadways, the requirements of sub-clause 5.9 of SABS 1200 DB should be observed. In other areas, compaction to 90% modified AASHTO density is required.

PSA 5.4.3 Alterations and repairs to existing services

Unless the contrary is clearly specified in the Contract or ordered by the Employer's Agent, the Contractor shall not carry out alterations to existing services. When any such alterations become necessary, the Contractor shall promptly 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.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Should damage occur to any existing services, the Contractor shall immediately inform the Employer's Agent, or when this is not possible, the relevant authority, and obtain instructions as to who should carry out repairs. In urgent cases, the Contractor shall take appropriate steps to minimise damage to and interruption of the service. No repairs of telecommunication cables or electric power lines and cables shall be attempted by the Contractor.

Before the commencement of any excavation the Contractor shall confirm the name and telephone number of the relevant officials directly concerned with the known or suspected services, shall acquaint himself with the position of the control points of the services and shall have readily available the equipment necessary to shut-off and isolate any such service. The Contractor shall liaise with the relevant authorities or controlling bodies for the necessary temporary closure of any services during construction.

PSA 5.7 Safety

Replace the contents of Sub-clause 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 his 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), provide the following:

- (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, 1993 (Act No 85 of 1993) 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;
- (b) Provide, install and maintain 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;
- (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;
- (d) Implement all necessary measures so as to ensure compliance with the Act by all subcontractors engaged by the Contractor and their employees engaged on the works; and
- (e) Full compliance 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 's representative may reasonably require.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



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 9.2 (GCC 2015) 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 9.2.1.3.6 (GCC 2015) of the Conditions of Contract should the Contractor fail to complete the Works on or before the specified due completion date 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 Clause 9.2.1.3.6 (GCC 2015) of the Conditions of Contract and for the Employer to cancel the Contract in accordance with the further provisions of the said Clause 9.2 (GCC 2015)."

PSA 7 TESTING

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;
- (d) Any other laboratory that the Employer's Agent approves in his absolute discretion."

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSA 8 MEASUREMENT AND PAYMENT****PSA 8.1 Measurement****PSA 8.1.1 Method of measurement, all sections**

In the second line of Sub-clause 8.1.1, after the words "standardized specification or in" add:

"the measurement and payment of the standard specification, particular specification or".

PSA 8.1.2 Preliminary and General item or section**PSA 8.1.2.2 Contents**

Replace the contents of this sub-clause with the following:

"Except only where specific provision is made in the Specifications and/or the Schedule of Quantities for separate compensation for any of these items, the Contractor's Bid sums under items PSA 8.3 and PSA 8.4 shall collectively cover all charges for:

- risks, costs and obligations in terms of the Conditions of Contract and of this standardized specification;
- 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 the permanent or temporary work;
- providing such facilities on site as may be required by the Contractor for the proper performance of the Contract and for its personnel, including, but without limitation, providing offices, storage facilities, workshops, ablutions, services such as water, electricity, sewage and rubbish disposal, access roads and all other facilities required, as well as for the maintenance;
- erection, maintenance and removal of temporary fencing and barricades;
- dealing with water (Sub-clause 5.5);
- access to works (Sub-clause 5.8); and
- providing and maintaining the fire-fighting equipment, as well as training the work teams in their use;
- any other items deemed necessary by the Contractor."

PSA 8.2 Payment**PSA 8.2.2 Time-related items**

Replace the contents of Sub-clause 8.2.2 with the following:

"Subject to the provisions of Sub-clauses 8.2.3 and 8.2.4, payment under item 8.4.1 (time-related item) will be made monthly in equal amounts, calculated by dividing the sum for

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



the item by the Contract period in months, provided always that the total of the monthly amounts so paid for the item is not out of proportion to the value of the progress of the Works as a whole."

Notwithstanding the stipulation of Sub-clause 8.2.2, an approved extension of time will only entitle the Contractor to payment in terms of Clause 5.12 of GCC 2015.

PSA 8.3 Scheduled fixed-charge and value-related items

PSA 8.3.1 Contractual requirements

Replace the contents of this sub-clause with the following:

PSA 8.3.1 Preliminary and general charges Unit: sum

The sums shall include full compensation for all preliminary and general charges as described in Sub-clause PSA 8.1.2.2.

Payment for "operation and maintenance of facilities for the Employer's Agent", in accordance with Sub-clause 8.4.2.1 will not be authorized by the Employer's Agent until the name board has been erected and approved.

PSA 8.3.2 Value-related preliminary and general charges Unit: sum

The sums tendered shall include full compensation for all value-related preliminary and general charges as described in Sub-clause PSA 8.1.2.2."

PSA 8.4 Schedule of time-related items

Replace the contents of Sub-clause 8.4 with the following:

PSA 8.4.1 Time-related preliminary and general charges Unit: sum

The sum tendered shall include full compensation for all time-related preliminary and general charges as described in sub-clause PSA 8.1.2.2. Payment will be made as described in sub-clause PSA 8.2.2."

PSA 8.4.5 Other Time-related Obligations

PSA 8.4.5.1 Provision of Security Personnel Unit: Sum

This item shall cover the cost of providing such security personnel the Contractor deems appropriate, taking cognizance of the location of the site and the historical record of incidents of crime in the area.

PSA 8.4.6 Compensation in terms of Clause 5.12.2.4 of the General Conditions of Contract – 2015 and Clause 9.1.4 of the Contract Data, for delays incurred:

PSA 8.4.6.1 Plant Unit: Sum per working day

PSA 8.4.6.2 Labour Unit: Sum per working day

PSA 8.4.6.3 Supervision Unit: Sum per working day

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSA 8.4.6.4 Other services, facilities etc. not covered by (a), (b) and (c)**

Unit: Sum per working day

The sum tendered for each item shall cover the full and final standing cost per day of delaying the specified resource or facility and no additional compensation shall apply, notwithstanding any provisions to the contrary in the contract documents, or in respect of any extension of time granted in relation to the circumstances described in Clauses 5.12.2.4, 9.1.1 and 9.1.2 of the General Conditions of Contract - 2015.

For the purposes of calculating the total delay, a working week shall be held to consist of five working days and a working day is 9 hours.

Payment for partial standing of any of the scheduled resources for a day or part thereof, or the standing of a complete resource for a part day, will be made pro-rata in proportion to an appropriate factor assessed by the Employer's Agent.

The amount by which compensation for delays is adjusted shall be subject to the contract price adjustment formula as defined in the General Conditions of Contract - 2015.

This payment item shall only apply to delays which in the opinion of the Employer's Agent are due to the circumstances described in Clauses 5.12.2.4, 9.1.1 and 9.1.2 of the General Conditions of Contract - 2015.

The cost of delays incurred for all other circumstances shall be treated as provided for in the General Conditions of Contract -2015.

The provision of this clause shall in no way prejudice the rights of either the Employer or the Contractor to terminate the contract in terms of the provisions in clause 9 of the General Conditions of Contract - 2015.

The Contractor shall take note that no payment will be considered for any additional cost incurred in protecting his plant and site establishment, as well as for costs incurred in respect of damage to constructional plant and equipment.

PSA 8.4.6.1 Standing Time / Delays Due to Community Disruption *

(a) Plant Unit: Sum per working day

(b) Labour Unit: Sum per working day

(c) Supervision Unit: Sum per working day

(d) Other services, facilities etc. not covered by (a),
(b) and (c) Unit: Sum per working day

The sum tendered for each item shall cover the full and final standing cost per day of delaying the specified resource or facility and no additional compensation shall apply, notwithstanding any provisions to the contrary in the contract documents, or in respect of any extension of time granted in relation to the circumstances. This payment item shall only apply to delays which in the opinion of the Employer's Agent are due to the circumstances described in Clauses 5.12.2.4 resulting from community disruptions.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



For the purposes of calculating the total delay, a working week shall be held to consist of five working days and a working day is 9 hours.

Payment for partial standing of any of the scheduled resources for a day or part thereof, or the standing of a complete resource for a part day, will be made pro-rata in proportion to an appropriate factor assessed by the Employer's Agent.

The amount by which compensation for delays is adjusted shall be subject to the contract price adjustment.

The cost of delays incurred for all other circumstances shall be treated as provided for in the General Conditions of Contract 2015.

The provision of this clause shall in no way prejudice the rights of either the Employer or the Contractor to terminate the contract in terms of the provisions in clause 9 of the General Conditions of Contract 2015.

PSA 8.5 Sums stated provisionally by the Employer's Agent

Amend penultimate sentence of Sub-clause 8.5 to read:

"The percentage rate for (b)(2) above shall cover the Contractor's overheads, charges and profit on the work covered by the sums provisionally stated for (b)(1) above. Payment will be made on the basis of the sums actually paid for such work, exclusive of VAT."

PSA 8.7 Daywork

A provisional amount is included in the daywork schedule for materials, equipment and labour. Daywork will only be used upon specific instruction by the Employer's Agent.

In addition to the abovementioned amounts, provision is made for a mark-up to be used during the execution of daywork. Payment shall be regarded as full compensation for overheads, charges and profit and transport of the materials to be used when executing daywork.

Where daywork have been instructed by the Employer's Agent the returns must be submitted by fax or in person for signature of approval within 24 hours of the end of the working day on which the work was executed. Daywork returns shall be submitted on approved forms.

Add the following items:

PSA 8.9 Compliance with OHS Act and Regulations (including the construction regulations 2014)

Unit: sum

The bid sum shall include full compensation to the Contractor for compliance with all the requirements of the OHS Act and Regulations (including the Construction Regulations (7 February 2014) at all times for the full duration of the Contract, as described in C3.6.1 (for CIDB document format). The successful bidder shall provide the Employer's Agent with a complete breakdown of this bid sum, including risk assessment, health and safety plan, etc. The bid sum shall include a permanent, competent Health and Safety Officer on site.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



This sum will be paid to the Contractor in equal monthly amounts subject to proper/substantial compliance."

PSA 8.11 Testing of Materials and Workmanship

Unit: No.

When instructed to do so by the Employer's Agent, the Contractor shall arrange with an approved SANAS laboratory to carry out various tests on materials or elements submitted by the contractor for testing. Tests shall be carried out strictly in accordance with the relevant SANS specification. The Employer's Agent will be afforded open access to the laboratory concerned and will be allowed to inspect the laboratory's premises and methods of testing, if so desired.

The rates submitted shall include for the full cost of the test, including all transport costs, sampling and storing.

PSA 8.12 Compliance with requirements of the Environmental Management Plan (EMP) Unit: Sum

The contractor shall comply with the requirements of the Environmental Management Plan when relevant. The contractor shall tender the lump sums in the Bill of Quantities to cover his initial obligations in respect to the Environmental Regulations. The tendered sums shall include full compensation to the Contractor for compliance with all the requirements of the Environmental Regulations at all times for the full duration of the Assignment.

The sums as listed will be paid to the Contractor in equal monthly amounts subject to proper/substantial compliance. Compliance will be monitored by an Environmental Control Officer through regular audits."

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSAB EMPLOYER'S AGENT'S OFFICE (SANS 1200AB)****PSAB 1 NAME BOARDS (Clause 3.1)**

Two contract notice boards conforming to the standard requirements of the SA Association of Consulting Employer's Agent and indicated on drawing 162-101 must be supplied and erected at positions to be indicated by the Employer's Agent for the duration of the Contract.

PSAB 2 OFFICE BUILDING (Clause 3.2)

A prime cost item has been allowed in the Schedule of Quantities to cover all costs associated with the provision of office facilities for the Employer's Agent's Representative.

Two offices shall be provided and furnished for the Employer's Agent's Representatives and maintained for the duration of the Contract. The office facilities shall be furnished as per SABS 1200 AB, as amended below:

The offices shall consist of a room with a floor area of at least 20m² with ceiling height of at least 2,5m.

All offices and other facilities shall be weatherproof with wood board floors that are at least 150mm above the ground, with ceilings, a lockable door, and two opening windows of 3m² glazed.

Each office shall be well ventilated and insulated as to provide comfortable working conditions.

The internal finishing of the office shall include:

- (a) 1 x desk minimum size 1,5m x 0,9m and one lockable drawer;
- (b) 1 x high stool;
- (c) 2 x office chairs;
- (d) 1 x white board mounted to the wall and a set of white board markers;
- (e) 1 x lockable upright steel cabinet with three shelves;
- (f) 1 x steel filing cabinet with four drawers;
- (g) racks for hanging contract drawings;
- (h) louvre blinds for each window;
- (i) 2 x 15A plug points;
- (j) 1 x 1,2m double fluorescent lighting;
- (k) 1 x acceptable model air conditioner, capable of maintaining a room temperature between 16°C and 22°C;
- (l) 1 x hand wash basin with plug, soap dish and cold-water tap;
- (m) Kitchenette in accordance with the standards specified for offices;
- (n) 1 x new digital camera; and
- (o) 1 x complete toilet assembly with toilet paper holder for the exclusive use of the Employer's Agent as specified in the Project Specifications.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



The internal finishing of the office shall include:

- (a) 1 x 12-seat conference table;
- (b) 12 x conference table chairs;
- (c) 1 x serving table with top size 1,5m x 0,9m;
- (d) louvre blinds for each window;
- (e) 2 x 15A plug points;
- (f) 1 x 1,2m double fluorescent lighting; and
- (g) 1 x acceptable model air conditioner, capable of maintaining a room temperature between 16°C and 22°C.

Upon completion of the Works ownership of all buildings, furnishings and equipment specified shall revert to the Contractor who shall remove it from Site.

PSAB 3 ACCOMMODATION

A prime cost item has been allowed in the Schedule of Quantities to cover all costs associated with the provision of accommodation for the Employer's Agent's Representative.

PSAB 4 TRANSPORTATION

A prime cost item has been allowed in the Schedule of Quantities to cover all costs associated with the provision of transportation for the Employer's Agent's Representative.

PSAB 5 TELEPHONE AND COMMUNICATION

A prime cost item has been allowed in the Schedule of Quantities to cover all costs associated with the provision of communication for the Employer's Agent's Representative.

PSAB 6 PHOTOCOPYING MACHINE AND PERSONAL COMPUTER

A prime cost item has been allowed in the Schedule of Quantities to cover all costs associated with the provision of a photocopying machine and personal computer for the Employer's Agent's Representative.

PSAB 8 SURVEY ASSISTANT (Clause 6.5)

One suitably experienced survey assistant shall be made available for the sole use of the Employer's Agent's Representative for the duration of the Contract.

The survey assistant may also be required to do other administrative tasks for the Employer's Agent's Representative.

The Contractor shall be responsible for transport costs of the survey assistant and the Community Liaison Officer for the duration of the Contract.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSAB 9 SURVEY EQUIPMENT**

The survey equipment listed below shall be made available and be maintained in good working condition for the exclusive use of the Employer's Agent's Representative for the duration of the Contract. Payment will be made as provided for the Time Related Items included Schedule 1.

- (a) 1 x automatic level with tripod and leather carry case (Zeiss N1-2 or equivalent)
- (b) 1 x nylon-coated steel tape 100m long and 10mm wide
- (c) 1 x 5m long steel tape
- (d) 1 x 5m long 3-piece telescopic survey staves (double-faced metric) complete with angle bracket level
- (e) 1 x "Rabone" type steel tape 50m long and 13mm wide
- (f) 1 x 100m long 50kg breaking strength fish line
- (g) 1 x 1,0m long spirit level
- (h) 1 x 3,0m aluminum straight level
- (i) 5 x red and white ranging rods
- (j) 2 x tripod holders for ranging rods.

PSAB 10 CARPORTS

The Contractor shall provide and maintain two carports with waterproof roofing for the exclusive use of the Employer's Agent's Representative for the duration of the Contract. The full extent of the area under the carport shall be covered with a 100mm layer of 19mm crushed stone aggregate.

PSAB 11 FEATURES REQUIRING SPECIAL ATTENTION**PSAB 11.1 Surveying**

The Contractor must employ or appoint a competent Employer's Agent's Representative surveyor to set out the Works, and he must ensure that the specified surveying details and tolerances are adhered to.

The control points available for the setting out of the Works are indicated on the drawings. These control points can be used in conjunction with any other trigonometric beacon registered with the Surveyor General to fix positions. Only the control points provided by the Employer's Agent may be used for the setting out of levels.

The Works must be set out in accordance with the tolerances in SABS 1200 LD, with the exception that the slopes on pipe inverts may not be less than 95% of the specified slopes.

No beacons, reference pegs, corner pegs, etc. may be disturbed or removed without prior consent from the Employer's Agent.

A provisional sum has been provided in Item 1.3.1.15 in the Schedule of Quantities to cover reimbursement to the Contractor for payments made to an Engineering surveyor for setting out and other surveying work.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSAB 11.2 Existing services**

The Contractor must take all precautions against damaging existing services along the pipeline route or adjacent properties.

The locations of all known existing services are shown on the Drawings. The Contractor will be held responsible for any damage to these services during the execution of the Works. Damaged services must immediately be reported to the relevant authorities, and repaired to the satisfaction of the authority and the Employer's Agent. The repair work must be executed immediately.

All information pertaining to existing services is provided in good faith but with no guarantees.

PSAB 11.3 Contractor's representative

The Contractor must appoint a designated and competent person as his representative for the duration of the contract at the official site handover, in terms of LAW 6 (1983): Law on Machinery and Occupational Safety Act.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSC SITE CLEARANCE (SABS 1200 C)****PSC 3 MATERIALS****PSC 3.1 Disposal of material**

Substitute the first sentence of C 3.1 with the following:

An area for the disposal of material obtained from clearing and grubbing, demolition of manholes, dismantling and removal of pipes shall be disposed of site to the nearest municipal dumping site. The use of the disposal area must be confirmed with the Employer prior to disposal.

PSC 5 CONSTRUCTION**PSC 5.1 Area to be cleared and grubbed**

Substitute the first sentence of C 5.1 with the following:

Clearing and grubbing shall only be done in areas as instructed in writing by the Engineer. Clearing and grubbing of pipe and cable routes shall be limited to a 3 m wide strip.

The Contractor may proceed with clearing and grubbing after hand-over of the site. Substitute the last paragraph with the following:

The Contractor shall program his work in such a manner that re-clearing will not be necessary. The cost of re-clearing shall be borne by the Contractor.

Where suitable topsoil exists within the limits of the area to be excavated, the Contractor shall remove the topsoil to an average depth of 150 mm together with any veld grasses and other similar vegetation as directed by the Engineer. The topsoil shall be transported and deposited in temporary stockpiles.

PSC 5.5 Re-clearing of vegetation

Add the following:

"When 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 therefore advised not to clear the areas too soon."

PSC 5.6 Conservation of topsoil

Replace the contents of Sub-clause 5.6 with the following:

All suitable topsoil removed shall be conserved as specified in Sub-clause 5.2.1.2 of SANS 1200 D and spread as specified in Subclause 5.2.4.2."

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSC 5.2 Cutting of trees**

Trees outside the area to be excavated for the new structures must be left standing and undamaged, except when otherwise ordered, in writing, by the Engineer.

A penalty of R2000-00 per tree for trees damaged and/or removed will be charged.

PSC 5.9 Existing fence

The fences around the site shall not be removed and shall be repaired immediately after damage to them has occurred.

The Contractor is strongly advised to make sketches and, where applicable, take photographs of existing fences before they are removed to avoid, as far as possible, arguments that may arise between himself and the property owner as to the quality of the re-erected fences.

PSC 8 MEASUREMENT AND PAYMENT

PSC 8.2.2 Separate items shall be scheduled for the removal of trees where the stumps are to be left in place.

PSC 8.2.7 Demolition, removal and disposal of pipelines Unit: m

DELETE FROM THE SUBCLAUSE THE WORDS: "but not the cost of excavation and backfilling"

ADD TO SUBCLAUSE:

"Including the cost of removal of rubble to an approved spoil site, backfilling any excavations and compacting to 90% modified AASHTO density"

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSD EARTHWORKS (SANS 1200D)****PSD 2 INTERPRETATIONS****PS D 2.3 Definitions**

Add the following to D 2.3:

Sand (cohesionless and non-cohesive)

For the purpose of the compaction requirements, a non-plastic material of which not less than 95 % by mass passes a sieve of nominal aperture size 4,75 mm, and not more than 10 % passes a sieve of nominal aperture size 0,075 mm.

PSD 3 MATERIALS**PSD 3.1 Classification for excavation purposes****PSD 3.1.1 Method of classifying**

Add the following:

"The classification of material other than 'soft excavation' shall be agreed upon before excavation may commence.

The Contractor shall immediately inform the Employer's Agent if and when the nature of the material being excavated changes to such an extent that a new classification is warranted for further excavation. Failure on the part of the Contractor to advise the Employer's Agent in good time shall entitle the Employer's Agent to reclassify, at his discretion, such excavated material."

PSD 3.1.2 Classes of Excavation

Add the following to D 3.1.2:

Under this contract soft and intermediate excavation shall be classified together as soft excavation, and hard rock and boulder excavation, where boulders are larger than 1 m³, shall be classified together as hard rock excavation. Boulders smaller than 1 m³ shall be classified together with soft excavation.

Rock shall be defined as material that requires blasting in order to be excavated.

PSD 3.3 Selection**PSD 3.3.1 General**

Substitute the second paragraph of D 3.3.1 with the following:

The Contractor shall deal in such a way with materials from all excavations for structures and pipe trenches to ensure that usable material is not contaminated with unsuitable material. If usable material is contaminated, such contaminated material shall be removed and replaced with material of standard at least equal to the in situ usable material, all at

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



the Contractor's expense. No additional payment shall be made in respect of this, and all relevant costs shall be deemed to be included in the tendered rates.

Add the following to D 3:

PSD 3.4 Subsoil drains

A subsoil drain consisting of 110 mm or 160 mm diameter perforated or slotted uPVC pipes, or M100 or M150 diameter geopipes in a bed of 19 mm stone or no fines concrete, all as specified and shown in the drawings, shall be installed where shown on the drawings. The pipes shall be connected with approved couplings and a gradient as shown in the drawings.

PSD 3.4.1 Material for Subsoil Drainage

PSD 3.4.1.1 Pipes

Pipes for subsoil drainage shall be uPVC pipes complying with the requirements of SANS 791, but shall be perforated or slotted.

The size of perforations in perforated pipes shall in all cases be 8 mm in diameter $\pm 1,5$ mm and the number of perforations per metre shall be not less than 26 for 110 mm pipes and 52 for 160 mm pipes. Perforations shall be spaced in two rows for 110 mm pipes and in three rows for 160 mm pipes.

Slotted pipes shall have a slot width of 8 mm $\pm 1,5$ mm. The arrangement of slots shall be subject to the Engineer's approval, but the total slot area shall be not less than that presented for perforations.

Pipes without slots or perforations required for conveying ground water from the subsoil drainage proper to the point of discharge, shall be uPVC pipes as specified above.

PSD 3.4.2 Crushed Stone

Crushed stone in subsoil drains shall be 19 mm single-sized stone complying with the grading requirements of stone for concrete in SANS 1083.

PSD 3.4.3 Geotextile Blanket

The geotextile blanket around subsoil drains shall be a nonwoven, continuous filament, needle punched, polyester geotextile equal to Kaytech Bidim A2.

PSD 3.4.4 Sand

Sand in subsoil drains shall comply with the requirements of PSD 2.3.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSD 4 PLANT**

Add the following to D 4:

PSD 4.5 Avoiding quagmire conditions

In order to prevent quagmire conditions occurring in the excavations, relatively static plant such as back-actors shall be used combined with hand trimming to complete the excavation to final level. Should the Contractor allow quagmire conditions to develop, he shall, at his own expense, take such steps to rectify the conditions as the Engineer may order.

PSD 5 CONSTRUCTION**PSD 5.1 Precautions****PSD 5.1.1.1 Barricading and lighting**

REPLACE "Machinery and Occupational Safety Act, 1983 (Act 6 of 1983)" WITH "Occupational Health and Safety Act, 1993 (Act 85 of 1993)".

PSD 5.1.1.2 Safeguarding of excavations

REPLACE "Machinery and Occupational Safety Act" WITH "Occupational Health and Safety Act, 1993 (Act 85 of 1993)".

PSD 5.1.1.3 Explosives

REPLACE THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"The Contractor will generally be permitted to use explosives for breaking up hard material during excavations, for demolishing existing structures, and for other purposes where explosives are normally required, subject to the following conditions:

- (a) The Employer's Agent may prohibit the use of explosives in cases where, in his opinion, the risk of injury to persons or damage to property or to adjoining structures is too high. Such action by the Employer's Agent does not entitle the Contractor to additional payment for having to resort to less economical methods of construction. Blasting in built up residential area will not be allowed.
- (b) The Employer's Agent's prior written approval shall be obtained for each and every blasting operation. This approval may be withheld if the Contractor does not use explosives responsibly and carefully.
- (c) The Contractor shall comply fully with the requirements of the Explosives Act, 1997 (Act No 83 of 1997) and all other legislation and regulations as may be applicable to blasting and the use of explosives.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- (d) Before blasting is undertaken, the Contractor shall satisfy the Employer's Agent that he has established whether or not the insurers concerned require pre- and post-blasting inspections of buildings and structures within a certain radius of the proposed blasting.
- (e) Should such inspections be required, the Contractor shall, together with the Employer's Agent and the insurer, examine and measure the buildings, houses or structures in the vicinity of the proposed blasting site and establish and record, together with the owner, lessee or occupier, the extent of any existing cracking or damage before blasting operations commence.
- (f) When there is a possibility of damage to power and telephone lines or any other services or property, the Contractor shall adapt his method of blasting and the size of the charges and shall use adequate protective measures (e.g., cover-blasting) to reduce the risk of damage.
- (g) All accidents, injury to persons and animals and damage to property shall be reported to the Employer's Agent in detail and in writing as soon as is practicable.
- (h) The Employer's Agent shall be given 24 hours' notice by the Contractor before each blasting operation is carried out.
- (i) When blasting to specified profiles, the Contractor shall so arrange the holes and charges that the resulting exposed surfaces are as sound as the nature of the material permits. The Contractor shall make good, at his own expense, any additional excavation necessitated by the shattering of rock in excess of any overbreak allowances specified in the Project Specifications or given on any Drawing.

Notwithstanding the Contractor's compliance with the above provisions, the Contractor shall remain liable for any injury to persons and animals and loss of or damage to property occurring as a result of blasting operations."

PSD 5.1.1.4 Barricading of Trenches (New Sub-Clause 5.1.1.4)

Add new Sub-Clause 5.1.1.4:

The Engineer may request that trenches must be barricaded due to reasons that he sees fit. The barricade will be at least 1,2 metres high and the distance between wire strands will not exceed 200 mm if a wire fence is erected. If a barricade net is erected the openings in the net will not exceed 100 x 100 mm. The barricade (net or wire fence) will be supported at distances not greater than 1 metres with suitable sturdy supports.

After completion of the work(s) the barricades must be removed completely and no barricading material may be left on site. The barricade will be erected on both sides of the trench with a minimum distance of 5 metres and a maximum distance of 10 metres from the side of the trench.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSD 5.1.2 Existing Services****PSD 5.1.2.2 Detection, location and exposure**

Add the following to D 5.1.2.2:

The requirements of PS A 5.4 shall apply mutatis mutandis.

If existing services are not shown on the drawings but the existence thereof can be reasonably expected, the Contractor shall, in conjunction with all relevant authorities, determine the exact path and location of such services before the commencement of construction. After locating the exact position of services, whether indicated on the drawings or not, such services shall be deemed to be known services and the Contractor shall be liable for all costs and subsequent costs arising from the damage thereof as a result of the Contractor's activities. These services must also be indicated on the "Record" drawings.

PSD 5.1.2.3 Protection of cables

Substitute "estimated position" in the second sentence of D 5.1.2.3 with "actual or exposed position".

PSD 5.1.4 Nuisance**PSD 5.1.4.1 Dust Nuisance**

Add the following to D 5.1.4.1:

The Contractor is responsible for dust control and is liable for all claims that may result from dust nuisance on all parts of the site and at all times from the date of handing over of the site to the completion date of the contract. No payment regarding the above-mentioned will be made and all costs shall be deemed to be covered by the tendered rates.

PSD 5.2 Methods and procedures**PSD 5.2.1.2 Conservation of topsoil**

Add the following to D 5.2.1.2:

Removal of topsoil shall only occur in areas as approved by the Engineer. The topsoil shall be conserved for use elsewhere.

Topsoil shall be deposited from the excavations and stockpiled separately in temporary stockpiles. In order to conserve the bacteriological life in the topsoil the storage heaps, strips or layers shall not exceed 1,5 m in total depth.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSD 5.2.2 Excavation: Add or Amend the Following Sub-Clauses****PSD 5.2.2.1 Excavations for general earthworks and for structures**

Add the following to D 5.2.2.1:

To the maximum extent possible all suitable materials excavated shall be used in the construction of the works. Such materials shall be selected from the unsuitable materials and stockpiled separately in temporary stockpiles on sites to be negotiated by the Contractor and approved by the Engineer.

The assessment of the quantity of suitable material to be stockpiled for filling shall be the responsibility of the Contractor entirely and any deficit shall be made good by the Contractor without cost to Rand Water. The balance of the suitable material for filling which is assessed as surplus to the requirements of the work may be removed from the sites as excavations proceed.

Strip foundations and encasement of pipes shall be cast directly against excavated surfaces.

Materials under foundations and floors of structures, which are regarded by the Engineer as unsuitable for the bearing of such structures shall be removed to the depths and widths, ordered. The excavated voids shall then be filled with sand compacted to 100 % of MAASHTO density, to the underside of such foundation or floors, unless a soil cement mixture in terms of PS D 5.2.3.2 is ordered by the Engineer.

PSD 5.2.2.3 Disposal

Substitute the second sentence of D 5.2.2.3 with the following:

All surplus material, which is suitable for fill, shall be transported to an open site, to be designated by the Engineer, spread and compacted as fill.

All material unsuitable for fill shall be transported to the municipal dumping site, 8km from the site, or a designated spoil area within a freehaul distance of 1 500 m of the site boundaries.

PSD 5.2.2.4 Excavation limits for payment purposes

For measurement and payment purposes, the limits of the excavations for structures shall be as shown on the Drawings.

Were no excavation limits are shown on the Drawings and the Engineer has decided that formwork has to be provided to the sides of a concrete member, the limits of the excavation for measurement and payment purposes shall be the vertical planes 0,5m outside the perimeter of the concrete member for which the formwork is to be provided at the founding level as shown on the Drawings.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSD 5.2.3.1 Embankments**

Add the following to D 5.2.3.1:

Embankments of ponds and terraces shall be constructed of approved material from excavations and shall be compacted to 95 % (100 % for sand) of MAASHTO density, in layers not exceeding 150 mm in depth.

PSD 5.2.3.2 Backfilling of trenches and backfilling against structures

Add the following to D 5.2.3.2:

Unless otherwise authorised by the Engineer no backfilling or filling against structures shall commence until the concrete has been in place for at least 14 days. Backfilling around structures shall be compacted to 95 % (100 % for sand) of MAASHTO density.

When specified or ordered by the Engineer the backfilling against structures shall be done using a mixture of soil cement. The mixture shall contain 5 % cement and just sufficient water for it to be placed and compacted like ordinary backfilling material.

Backfilling of all pipe trenches and around structures shall be performed in 150mm thick layers with material approved by the Engineer, each layer shall be compacted to 93% Modified AASHTO maximum dry density at optimum moisture content with sufficient water added uniformly to ensure that the specified density will be achieved for each layer. Each layer shall be completed before the next is added. Backfilling is not measured separately but is included in the tariff for the chambers. All over-excavation must be backfilled by the Contractor with mass concrete of the specified grade at his own cost. Where such over-excavation has been ordered by the Engineer, the backfilling with concrete will be measured and paid separately.

Add the following to D5.2.3:

PSD 5.2.3.3 Filling under floors

Filling under the floors of buildings shall be done with sand from commercial sources, compacted to 100 % of MAASHTO density.

PSD 5.2.4 Finishing**PSD 5.2.4.1 Final grading**

Add the following to D 5.2.4.1:

Terraces shall be trimmed to an even grade of 1 in 2.

PSD 5.2.4.2 Top soiling

Add the following to D 5.2.4.2:

Topsoil shall be placed on the sides and on the tops of embankments and other terraces where no paving is specified, or in areas where directed by the Engineer.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSD 5.2.4.3 Grass or other vegetation**

Add the following to D 5.2.4.3:

Planting shall be carried out at the earliest convenient stage of the construction and shall be arranged to suit the seasonal weather conditions. Undue humps and hollows shall be smoothed out before planting is commenced.

(a) Grassing

Stools or runners of "Kikuyu" or other grass approved by the Engineer shall be planted by forming trenches 75 mm deep at 300 mm intervals along lines at right angles to the direction of maximum slope, laying the stools or runners at intervals not exceeding 150 mm along the trenches and closing the trenches in such a way to cover the grass entirely. After planting the surface shall be lightly rolled with a hand roller with a maximum mass of 150 kg.

PSD 5.2.2.1 Excavation for general earthworks and for structures

Add the following to paragraph (b):

"When the nature of the material precludes the above procedure, additional excavations shall be carried out to provide working space for the erection of formwork. The bid rate for item 8.3.3 will be deemed to include the cost of a working width of 600 mm, but the Contractor may excavate a greater working width at no additional cost to the Employer. No backfilling of structures is to be done before a leak test, if required, has been successfully passed. Rates for excavation are inclusive of the backfilling and compaction around structures."

Replace the first sentence of paragraph (e) with the following:

"Where excavations have been carried out below the authorised levels, the Contractor shall backfill such excavations to the correct level with approved gravel compacted to 90% of modified AASHTO density or to the density of the surrounding material, whichever is the higher density. Where excavations for structures have been carried out in hard material, the Employer's Agent may direct that over-excavation be backfilled with weak concrete if there is a danger of settlement or differential settlement of the foundations."

PSD 5.2.5 Transport for earthworks

Replace the contents of Sub-clause 5.2.5 with the following:

"The transport of all excavated materials, irrespective of the distance and source, shall be deemed to be free-haul, the cost of which is included in the Contractor's rates and prices for the excavation of the materials. No separate compensation shall apply for the transportation of excavated materials."

PSD 5.2.6 Removal of Unsuitable Material

The provision of SANS 1200 DM: Earthworks (Roads) clause DM 5.2.3.2 shall apply mutatis mutandis.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PSD 5.2.7 Dewatering of foundation excavations

Over and above his general obligations in regard to dealing with water as specified in SANS 1200 A, the Contractor shall deal with and dispose of all water so as to ensure that the Works are kept sufficiently dry at all times so that they can be properly executed, and he shall protect them against flood damage.

For this purpose, the Contractor shall provide sufficient pumps, pipes and other equipment that may be necessary. Where necessary, the Contractor shall construct temporary berms, culverts and channels to drain away the water, but in order to limit such work as far as possible, the permanent drainage provided in the Contract shall be constructed at the earliest opportunity as may be practicable. The only allowance for permanent drainage under this contract is a 100 mm thick layer of NF19 concrete with drainage pipes as shown on the drawings.

Payment for dealing with water shall be included in the Contractor's rates for preliminary and general charges, except in so far as special provision for dealing with water may be made elsewhere in the Specifications.

PSD 5.2.8 Setting out of excavations

The Contractor shall set out the excavations accurately in accordance with the drawings and data supplied by the Engineer.

The Contractor shall provide, erect, set to line and level and maintain approved substantial working profiles on the perimeter of excavations and along the length of the trench at changes of grade and direction. Each working profile shall be fitted with a horizontal crossbar set at a predetermined height above the designed excavation profiles to which excavations are to be carried out and have setting marks, which will define the local setting out lines and the centre line of the trench. Where required by the Engineer the Contractor shall provide a working profile with the crossbar extending across the full width of the trench. A working profile shall remain in position during all stages of the excavations until the concrete is placed or the pipe is laid past the chainage of the working profile.

The Contractor shall provide sets of boning rods, templates and piano wire, for the sole use of the Engineer, for checking the profiles of the excavations. The Contractor shall also provide, set and level all the pegs required to transfer lines and levels to the excavation floor in order to control the preparation of the prescribed profiles.

Excavation will be required to expose existing pipelines to allow the installation of the drainage line. In exposing existing pipelines, the Contractor shall excavate by machine, or by hand, if necessary, around and under the pipelines taking care to avoid damage to the bitumen, cement mortar or epoxy coated pipes. Any damage caused to pipe coatings during excavations will be made good by the contractor and any costs so incurred will be for the contractors' expense.

The Contractor shall provide and use equipment and machinery of adequate capacity and suitable type and quality for the efficient and expeditious execution of the work.

PSD 5.2.9 Overbreak and over excavation

It is to be expected that during excavations material will be removed from below the prescribed profiles. In the cases where the excavation floor is formed of materials classified as Rock the additional depth will for purposes of this contract be termed overbreak and can

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



be expected to vary according to the nature of the rock, the jointing planes, the extent of weathering of the rock, the methods and procedures used in the blasting of the rock and the expertise of the personnel undertaking the blasting. In the case where the excavation floor is formed in materials classified as Soft, the additional depth will for purposes of this contract be termed over excavation.

PSD 5.2.10 Safety of excavations

Excavations shall be undertaken in a safe manner in compliance with the regulations promulgated under the Occupational Health and Safety Act (Act 85 of 1993) or any amendment thereof. Safety precautions to be observed by the Contractor shall include the sloping, stepping or benching or shoring, timbering or otherwise supporting the sides of the excavations or any other provision as stipulated in Regulation 13 of the aforesaid act, with which the Contractor declares himself to be conversant.

The shoring method adopted shall be compatible with the excavating, backfilling and construction method and shall not restrict the installation and construction.

Shores shall be designed to withstand the earth pressures exerted upon them from the side of the excavation, which shall include the superimposed loading of construction and pipe laying equipment.

The Engineer may call upon the Contractor to timber the sides of the excavation at any point, without cost to the client that he may consider in any way dangerous. Such timbering shall be left in place until the completion of the work at the point affected.

Timbering shall consist of open planning, walings and substantial struts and shall be carried out in a workmanlike manner and to the satisfaction of the Engineer.

The Contractor shall allow for the removal of timbering immediately prior to backfilling or on the instructions of the Engineer.

PSD 5.2.11 Maintaining the sides of the excavations

Maintaining the sides of the excavations in a safe condition shall at all times be the sole responsibility of the Contractor. No under-cutting of the sides will be allowed.

PSD 5.2.12 Protection of work

The Contractor shall provide, at his own expense, all measures necessary for the protection of the excavations during the progress of the work, shall be solely responsible for securing, lighting and watching all places dangerous to traffic, persons, animals or property, and shall be liable for all claims arising therefrom.

The excavations shall be maintained until the structures are completed and backfilled. Should the sides fall in, or any debris or water accumulate in the excavations due to any cause the excavation shall be cleaned out and any damage arising therefrom made good by the Contractor at his own cost as directed by the Engineer.

PSD 5.2.13 Material for filling

All material used in the filling beneath structures, behind walls, for formation of terraces and embankments and backfilling of pipes shall be suitable material as defined in the following clause.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Suitable material for filling beneath structures, behind walls, formation of terraces and embankments etc. and for stage will backfill in drainpipe trenches shall comprise loose, fine soil or powdered soft shales which on excavation, handling and compaction break down into a soil like texture and shall have the characteristics of a sandy silt or clayey sand material with a plasticity index not exceeding 15. The fill shall contain no oukclip or materials deleterious to concrete and shall be free of pebbles, stones and fragments of shattered rock with maximum dimensions exceeding 50 mm. The material used shall have a uniform moisture content and be free from roots and deleterious proportions of organic matter. The material shall not be too wet for practical drying to the required moisture content. Alternatively, where instructed by the Engineer, loose fine soil with a plasticity index exceeding 15 shall be used as suitable material for filling beneath structures and behind walls in association with cement or lime stabilization.

Suitable material for drainpipe bed and for stage I backfilling in drainpipe trenches shall comprise loose, fine soil or powdered soft shales, which on which on excavation, handling and compaction break down into a soil like texture and shall have the characteristics of a sandy silt or clayey sand material with a plasticity index not exceeding 15. The fill shall contain no oukclip or materials deleterious to bitumen wrapped steel pipes and shall be free of pebbles, stones and fragments of shattered rock with maximum dimensions exceeding 10 mm. The material used shall have a uniform moisture content and be free from roots and deleterious proportions of organic matter. The material shall not be too wet for practical drying to the required moisture content

Suitable material for use in road subbase and base layers in drainage pipeline trench at road crossings shall comprise selected graded crushed stone Class G1 as specified in terms of TRH14 – Guidelines for Road Construction Materials.

PSD 5.2.14 Source of materials

Unless authorized by the Engineer, suitable material shall be selected from materials excavated under the contract.

If insufficient suitable material for filling is available for selection from the excavations the Contractor shall with the approval of the Engineer, supplement the available suitable material for filling by importing suitable material approved by the Engineer. The Contractor shall negotiate for, obtain, load and transport to site the supplementary requirements for filling.

PSD 5.2.15 Compaction of in situ material

Where required the in-situ material at the excavation profile or at the surface exposed after the removal of unsuitable foundation material shall be compacted to 93% (ninety-three percent) of the Modified AASHTO to a depth of at least 150 mm below the exposed surface. Compaction shall be carried out between optimum moisture content and optimum moisture content plus 2% (two percent). Density testing of the compacted in situ material shall be carried out in accordance with Clause E17.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSD 5.2.16 Filling topsoil**

After the backfilling of the excavations has been completed to the subsoil surface the topsoil shall be returned to the upper 300 mm layer, from which it was removed to restore the natural ground surface. The topsoil shall be evenly spread and lightly compacted to leave the upper ground surface in a neat and tidy condition as near as may be to the original condition encountered before excavation commenced or to such details for the embankments as are indicated on the drawings.

PSD 8 MEASUREMENT AND PAYMENT**PS D 8.1 Basic Principles**

Add the following to D 8.1:

The rates for excavation shall also cover the cost of dealing with any stormwater or subsurface water, which may appear in the excavations.

PSD 8.3 Scheduled items**PS D 8.3.2 Bulk Excavation**

Add the following sub items to D 8.3.2:

- (a) Extra-over 8.3.2(a) for soil cement backfilling where specifically required by the Engineer (percentage of cement indicated) Unit: m³
- (b) The tendered rate for sub item PS D 8.3.2(c) shall be additional to the rates tendered for D 8.3.2(a) and shall cover the cost of all incidentals required for the complete backfilling with soil cement as specified. The rate shall also include for the trimming and compacting of the excavation before placement of soilcrete.
- (c) Excavate and dispose of unsuitable material from excavation bottom Unit: m³
- (d) The rate shall cover the cost of complying with all the precautions required in terms of D 5.1 in addition to the cost of excavation of the additional depth in any material and the disposal of the unsuitable material as specified in PS D 5.2.2.3.
- (e) Extra-over 8.3.2(a) for trimming and compacting terraces Unit: m²
- (f) The rate includes for the trimming and compacting of horizontal and sloping sides of the terraces before topsoil and grass is placed, including for the removal of large stones and rubble to form a uniform surface.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSD 8.3.3 Restricted Excavation**

Add the following sub items to D8.3.3

Restricted excavation shall be limited to those excavations detailed on the drawings or as agreed to by the Engineer as being restricted.

- (a) Extra-over 8.3.3(a) for soil cement backfilling (percentage of cement indicated) Unit: m³

The tendered rate for sub-item PS D 8.3.3(c) shall be additional to the rates tendered for D 8.3.3(a) and shall cover the cost of all incidentals required for the complete backfilling with soil cement as specified. The rate shall also include for the trimming and compacting of the excavation before placement of soilcrete.

- (b) Excavate and dispose of unsuitable material from excavation bottom Unit: m³

The rate shall cover the cost of complying with all the precautions required in terms of D 5.1 in addition to the cost of excavation of the additional depth in any material and the disposal of the unsuitable material as specified in PS D 5.2.2.3.

- (c) Extra-over 8.3.3(a) for trimming and compacting terraces Unit: m²

The rate includes for the trimming and compacting of horizontal and sloping sides of the terraces before topsoil and grass is placed, including for the removal of large stones and building rubble to form a uniform surface.

PSD 8.3.5 Extra excavation in all materials to provide working space around structures

Delete this sub clause and refer to sub clause PSD 5.2.2.4

PSD 8.3.8.1 c) Excavate by hand in soft material to expose existing service Unit: m³

Add the following to D 8.3.8.1(c):

Excavation by hand to expose existing services shall only be measured and paid for if so, ordered in writing by the Engineer. After the excavation of trial holes to determine the exact position and depth of existing services, at intervals as required by the Engineer, the excavation to a level of 300 mm above such services shall be measured and paid for as normal excavation, independent of the depth of such excavation. Only excavation within 300 mm of the existing services will be measured and paid for as excavation by hand and then only if ordered in writing by the Engineer. The rate shall also include the backfilling of the excavations and compaction thereof.

Add the following items in Sub-clause 8.3:

PSD 8.3.15 Extra over 8.3.3 for disposing of spoil material on a site provided by the Contractor and approved by the Employer's Agent Unit: m³

The unit of measurement shall be the cubic metre measured in accordance with Sub-clause 8.2 of SANS 1200 D of surplus and/or unsuitable material disposed of, on the instruction of the Employer's Agent, at a spoil site or spoil sites provided by the Contractor and approved by the Employer's Agent.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



The 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 acceptance charges for such material and for all other incidental costs to dispose of the spoil material."

PSD 8.4 Subsoil drains and dewatering of excavations

PSD 8.4.1 Pipes in Subsoil Drains

(a) Perforated or slotted uPVC pipes complete with couplings (state size) Unit: m

(b) uPVC fitting (state size and type of fitting) Unit: No

The rate shall cover the cost of supplying and installing the pipe or fitting in a stone bed or no-fines concrete, as indicated on the drawings.

PSD 8.4.2 Crushed stone in subsoil drains Unit: m³

The rate shall cover the cost of supplying, transporting irrespective of the distance and placing the stone in the subsoil drain, as indicated on the drawings.

PSD 8.4.3 Geotextile blanket in subsoil drains Unit: m²

The rate shall cover the cost of supplying the geotextile blanket and of placing it in the subsoil drain, as indicated on the drawings.

PSD 8.5 Dewatering of foundation excavations lump sum

Dewatering will be paid for as a lump sum for each structure or series of structures scheduled separately in the Schedule of Quantities. The lump sum shall be paid on a pro rata basis as the work progresses.

The tendered lump sum shall include full compensation for all work and operations required for keeping the excavations dewatered and dry and for the removal of silt and mud from the exposed concrete surfaces, all as specified in Sub-Clause PSD 5.2.7 of this section.

PSD 8.6 Empty and clean existing structures

The rate shall include all pumps, hoses etc. required to pump out liquids and sludge contained in an existing structure as well as the removal of sludge and sand remaining after the liquid has been pumped out.

Liquids and solids shall be pumped to other structures within a distance as specified while solids that cannot be pumped shall be loaded, transported and deposited at a suitable location within the freehaul distance or further as specified.

No electrical connection (electricity) will be available on site and the contractor must make his own provisions.

The unit of measurement shall be the cubic metre (m³) of liquid and sludge originally contained in the structure to be emptied.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Separate items are scheduled as follows:

(a) Pumping of water/sludge mixture to other structures within a distance of 500 metres	Unit : m3
(b) Pumping of water/sludge mixture to other structures within a distance of 500 metres	Unit : m3
(c) Removal of non-pumpable water/sludge/soil mixture within the freehaul distance of 1.5 km	Unit : m3

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSDB EARTHWORKS (Pipe trenches) (SANS 1200 DB)****PSDB 1 SCOPE**

Add the following to DB 1.1:

This specification also covers the excavation for cable trenches.

PSDB 2.2 Application

Substitute "pipe trenches" with "pipe and cable trenches" in DB 2.2.

PSDB 2.3 Definitions (Sub-Clause 2.3)

Add the following:

Topsoil

Topsoil is defined for the purpose of this Contract as the upper layer of soft material with a depth not exceeding 300mm below the natural ground surface in which veld or cultivated grass is growing.

Before proceeding with the bulk excavation, the Contractor shall strip the topsoil over the width of the pipe trench and place it in stockpiles, heaps or layers separate from other excavated material for later replacement in the upper layer of the backfilled trench. In order to conserve the bacteriological life in the topsoil, the storage heaps, strips or layers shall not exceed 1,5m in height.

After the backfilling of the trench has been completed to within 300mm of the natural ground level, the topsoil shall be returned to the upper 300mm layer from which it was removed. The topsoil shall be evenly spread and lightly compacted to leave the upper ground surface in a neat and tidy condition as near as possible to the original condition encountered before excavation commenced.

No topsoil shall be transported from the area from which it was excavated.

PSDB 3 MATERIALS**PSC 3.1 Classification for excavation purposes****PSC 3.1.1 Method of classifying**

Add the following:

"The classification of material other than 'soft excavation' shall be agreed upon before excavation may commence.

The Contractor shall immediately inform the Employer's Agent if and when the nature of the material being excavated changes to such an extent that a new classification is warranted for further excavation. Failure on the part of the Contractor to advise the Employer's Agent

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



in good time shall entitle the Employer's Agent to reclassify, at his discretion, such excavated material."

PSDB 3.5 Backfill materials

- (a) Substitute "from trenches" in DB 3.5(a) with "from trenches or excavations for structures".

Add the following paragraphs to Sub-clause 3.5:

- "(c) Soilcrete backfilling

The aggregate for soilcrete shall be mixed with 5% cement and shall consist of approved soil or gravel containing stones not bigger than 38mm 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 acquire a consistency that allows the mixture to be placed with vibrators to fill all voids between the pipe and the sides of the trench. Shuttering shall be used where necessary."

PSDB 4 PLANT

PSDB 4.1 Excavation equipment

Add the following to DB 4.1:

All excavations exceeding the specified widths, shall be backfilled with approved selected material. No payment shall be made for this, and all relevant costs shall be deemed to be included in the tendered rates.

PSDB 5 CONSTRUCTION

PSDB 5.1 Precautions

PSDB 5.1.2 Stormwater, seepage and dewatering of excavations

Substitute DB 5.1.2 with the following:

The costs of dealing with water shall be deemed to be included in the tendered rates for excavation and no additional payment shall be made in this respect.

Add the following to DB 5.1:

PSDB 5.1.5 Hand Excavation

Certain trenches will have to be excavated by hand, because of limited access and space. The Contractor is to ensure that all excavation done by hand is in strict accordance with the requirements of the Occupational Health and Safety Act.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSDB 5.2 Minimum base widths specified**

Substitute paragraph (b) of DB 5.2 with the following:

The minimum base width for pipes of external diameter not exceeding 125 mm shall be 600 mm plus the nominal diameter of the pipes, irrespective of the depth at which they are laid, except for subsurface drains where the width shall be 400 mm.

The minimum base width for electric cable trenches shall be 300 mm. Where more than one cable is installed in the same trench, the base width shall become 300 mm plus the distance specified between cables. The minimum distance between cables shall be 50 mm.

PSDB 5.5 Trench bottom

Substitute "90 %" in the second paragraph of DB 5.5 with "93 % (100 % for sand)".

PSDB 5.6 Backfilling**PSDB 5.6.2 Material for backfilling**

Substitute "from trench excavations" in the first paragraph of DB 5.6.2 with "from excavations for trenches and structures.

Add the following to DB 5.6.2:

Where pipe trenches cross a road the selected fill blanket specified in PS LB 3.2 shall be brought up to the bottom of the subbase.

PSDB 5.6.3 Disposal of soft excavation material

Add the following to DB 5.6.3:

The provisions of PS D 5.2.2.3 shall apply mutatis mutandis.

PSDB 5.7 Compaction**PSDB 5.7.2 Areas subject to traffic loads**

Substitute "98 %" in DB 5.7.2 with "100 %".

Add the following to DB 5.7.2:

Sand backfilling shall be compared to 100 % of MAASHTO density.

Add the following:

PSDB 5.11 Unstable trench bottom

The Employer's Agent may, upon consideration of the condition of the trench bottom, particularly with regard to the properties of the soil materials, order the use of a crushed stone layer in order to provide a stable platform for placing of the pipe bedding and laying

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



the pipe in certain sections of the trenches. The stone layer shall consist of 19 mm single-sized crushed stone, and shall have a specified thickness of 150 mm over the specified minimum base width.

Should the material in the trench bottom or the bedding material be of such a nature that it can penetrate the stone layer, the Employer's Agent may instruct the Contractor to enclose the stone layer completely within a geotextile filter blanket (Kaymat U14 or equal approved), which shall have overlaps of at least 200 mm."

PSDB 5.12 Cleaning up as work proceeds

The Contractor shall complete all backfilling, trimming, levelling and cleaning up of the Site as work proceeds. This work shall not lag by more than 300m behind the pipe laying team

PSDB 8 MEASUREMENT AND PAYMENT

PSDB 8.1 BASIC PRINCIPLES

Delete "along the route of the pipeline" in DB 8.1.1.

Add the following to DB 8.1.2(b):

The depth of electric cable trenches is as indicated on the relevant drawings.

PSDB 8.2 Computation of quantities

PSDB 8.2.4 Shoring

Add the following to DB 8.2.4:

Shoring will only be measured and paid for if written approval is given by the Engineer before it is installed.

PSDB 8.3 Scheduled items

PSDB 8.3.2 Excavation

Unit: m

Add the following to DB 8.3.2:

Only lengths that have been completed and backfilled will be measured for payment. Payment will be made in two instalments, 80% at completion of the excavation and backfilling and the final 20% after final approval, which will take account of surface finishing, disposal of all unused material and acceptance of all test results including welding tests and hydraulic testing of the pipe as specified.

The rates tendered for excavation shall include backfilling at any point or points as the Engineer may direct and the disposal of surplus and unsuitable material at a site found by the Contractor. The rates shall also include the cost of selective excavation. The tendered rates shall also include full compensation for the provision of all labour, plant and equipment for shoring measures required.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



The rate shall also cover the cost of dealing with any stormwater or subsurface water, which may appear in the trenches.

Add the following sub item:

- (d) Excavate by hand in soft material to expose existing service Unit: m³

The provisions of sub clause PS D 8.3.8.1(c) shall apply mutatis mutandis.

- (e) Excavations and backfill by hand Unit: m³

The provisions of sub clause DB 8.3.2(a) shall apply mutatis mutandis.

PSDB 8.3.5 Existing services that intersect or adjoin a pipe trench

PSDB 8.3.5 a) Services that intersect a trench Unit: No

Add the following to DB 8.3.5(a):

Existing services with a depth of cover exceeding 300 mm, measured from the bottom of excavation to the top of the existing service shall not be measured and paid for.

The rate shall also cover the cost of the following:

- (a) Sufficient photo's being taken of existing services and submitted to the Engineer before they are being crossed, if there is a possibility of a difference of opinion over the condition of these services.
- (b) Repair of damaged services to its original condition.
- (c) If such a service is removed, replacement thereof.

PSDB 8.3.5 b) Services that adjoin a trench Unit: No or m

Add the following to DB 8.3.5 (b):

The unit "number" will only be used for services such as poles and trees.

No payment will be made for overhead services that do not rest directly on the ground except where allowance is made for this in the schedule of quantities.

Existing services that rest directly on the ground e.g., poles, trees, walls and structures are handled in the same way as underground services, but the axis of the service will be determined as follows:

The vertical axis is defined as the nearest side or corner of the existing structure to the excavation, measured at the point where the structure and natural ground level intersect. The horizontal axis will be at the point where the structure and the natural ground level intersect. In this instance, where the excavation falls above the 45° line but within 1,0 meter horizontally from the structure, the service will also be measured as adjoining.

If the structure, according to the above-mentioned, does not qualify as an adjoining service but the foundation of the structure is such that if a 45° line drawn from the nearest bottom corner thereof cuts through the excavation, the structure will be measured as an adjoining service **if approved by the Engineer.**

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



There will be distinguished between existing trunk services and existing erf connection.

PSDB 8.3.6.2 Extra-over DB 8.3.6.1 for imported material

Unit: m³

The quantity will be calculated according to the actual volume of material placed in the final position according to the specified dimensions.

The rate is an "extra-over" Item DB 8.3.6.1 and includes all costs of supplying and placing of imported material in the final position with material from commercial sources.

PSDB 8.3.8 Pipe trenches crossing existing gravel roads

Unit: m³

The rate shall cover the cost to backfill the trenches with sand, stabilise with 5 %, by volume, with cement and compact to 100 % MAASHTO density.

PSDB 8.3.9 Removal of Existing Pipes to dispose (New Sub-Clause 8.3.8)

- (a) Excavate in all materials to expose pipes, remove pipes from site and dispose thereof Unit: m
- (b) Excavate in all materials to expose valves, fittings and specials declared unusable, remove from site and dispose thereof Unit: No

Demolishing and disposal of any existing asbestos cement pipes shall be in accordance with the Asbestos Regulations 2001 under the Occupational Health and Safety Act no 85 of 1993.

For pipes, the unit of measurement shall be the linear metre of each type and diameter of pipe removed from the site in accordance with PSDB 5.13, measured in plain view long the centreline of the pipeline, without deduction for specials, junction boxes, manholes, valve chambers and the like as may be encountered. Separate items shall be scheduled for each different type and diameter of pipe.

For specials, the unit of measurement shall be the number of specials declared unusable by the Engineer in accordance with sub-clause PSDB 5.13, irrespective of the type or diameter of the special.

The tendered rates shall be all-inclusive and include for excavating in accordance with PSDB 5.13 to expose the pipe to 100mm below its bottom, as well as for excavating around junction boxes, manholes, valve chambers and the like. The rate shall also include the backfilling of the excavated material after all pipes and specials have been removed from the trench and compacting to 90% MOD AASHTO density. Material required from other necessary excavations on site, borrow pits or commercial sources as instructed by the Engineer to make up deficiency in backfill material will be measured and paid for under Sub-Clause 8.3.3.1 of SANS 1200 DB, but the compaction thereof to 90% MOD AASHTO density will be included in this rate.

The tendered rates shall further be fully inclusive for cutting or uncoupling the individual pipes and specials, all additional excavation as may be necessary to facilitate the insertion of lifting slings or the utilization of other lifting equipment, the provision and utilization of all such lifting equipment as may be necessary (e.g., cranes), for lifting the pipes and specials out of the trench. The tendered rates shall further include for the demolition and removal from the trench of all associated pipeline structures as may be encountered, such as

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



junction boxes, inlet and outlet structures, valve chambers, anchor blocks and the like, and the loading and removal of the pipes, specials and debris to spoil at an approved spoil site, including the full transport cost.

PSDB 8.3.10 Removal of Existing Pipes and Specials to re-use (New Sub-Clause 8.3.9)

- (a) Excavate in all materials to expose pipes, remove pipes from site and deliver to Municipal store yard Unit: m
- (b) Excavate in all materials to expose valves, fittings and specials, remove from site and deliver to Municipal store yard Unit: No

Demolishing and disposal of any existing asbestos cement pipes shall be in accordance with the Asbestos Regulations 2001 under the Occupational Health and Safety Act no 85 of 1993.

For pipes, the unit of measurement shall be the linear metre of each type and diameter of pipe removed from the site and delivered to the Municipal store yard in accordance with PSDB 5.13, measured in plain view long the centreline of the pipeline, without deduction for specials, junction boxes, manholes, valve chambers and the like as may be encountered. Separate items shall be scheduled for each different type and diameter of pipe.

For specials, the unit of measurement shall be the number of specials declared re-usable by the Engineer in accordance with sub-clause PSDB 5.13, irrespective of the type or diameter of the special, delivered to the Rand Water store yard.

The tendered rates shall be all-inclusive and include for excavating in accordance with PSDB 5.13 to expose the pipe to 100mm below its bottom, as well as for excavating around junction boxes, manholes, valve chambers and the like. The rate shall also include the backfilling of the excavated material after all pipes and specials have been removed from the trench and compacting to 90% MOD AASHTO density. Material required from other necessary excavations on site, borrow pits or commercial sources as instructed by the Engineer required to make up deficiency in backfill material will be measured and paid for under Sub-Clause 8.3.3.1 of SANS 1200 DB, but the compaction thereof to 90% MOD AASHTO density will be included in this rate.

The tendered rates shall further be fully inclusive for cutting or uncoupling the individual pipes and specials, all additional excavation as may be necessary to facilitate the insertion of lifting slings or the utilization of other lifting equipment, the provision and utilization of all such lifting equipment as may be necessary (e.g., cranes), for lifting the pipes and specials out of the trench. The tendered rate shall be fully inclusive for loading the pipes at the side of the trench, transporting to and off-loading at the specified Municipal store yard location and carefully stacking separately according to the type, class and diameter of the pipes and specials, including the full transport cost.

The tendered rates shall further include for the demolition and removal from the trench of all associated pipeline structures as may be encountered, such as junction boxes, inlet and outlet structures, valve chambers, anchor blocks and the like, loading and removal to spoil at an approved spoil site, including the full transport cost.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSDM EARTHWORKS (ROADS, SUBGRADE) (SANS 120 DB)****PSDM 3 MATERIALS****PSDM 3.1 Classification for excavation purposes**

Add the following to DM 3.1:

The requirements of PS D 3.1.2 shall apply mutatis mutandis.

All in situ pavement material shall be classified as soft material for excavation purposes.

PSDM 3.2 Classification for placing purposes**PSDM 3.2.3 Selected Layers**

Substitute DM 3.2.3 with the following:

All imported material underlying the subbase or base of the final road prism, whichever may be applicable, that does not comply with the requirements for lower selected layer or upper selected layer in the respective depth categories, shall be removed and replaced with material complying with the requirements of selected layers, all at the Contractor's expense.

PSDM 5 CONSTRUCTION**PSDM 5.1 Precautions****PSDM 5.1.1 Safety, Existing Services, Stormwater, Etc. And Nuisance**

Add the following to DM 5.1.1:

The requirements of PS A 5.4 shall apply mutatis mutandis.

PSDM 5.2 Methods and procedures**PSDM 5.2.2.3 b) Cut to spoil**

Substitute DM 5.2.2.3(b) with the following:

The requirements of PS D 5.2.2.3 shall apply mutatis mutandis.

PSDM 5.2.2.4 Temporary stockpiling of materials

Add the following to DM 5.2.2.4:

The Contractor shall program the works in such a manner that suitable excavated material shall, if practically possible, be placed directly in the appropriate position to ensure that temporary stockpiling is limited to an absolute minimum. No payment shall be made for the temporary stockpiling of material where such material is to be used for backfilling of pipe trenches, except when so ordered in writing by the Engineer.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSDM 5.2.3 Treatment of roadbed****PSDM 5.2.3.3 Treatment of roadbed****(a) Preparation and compaction of roadbed**

Substitute the first paragraph of DM 5.2.3.3(a) with the following:

The roadbed shall be scarified to a depth of 150 mm, watered, shaped and compacted to 90 % of MAASHTO density (100 % for sand), except where otherwise ordered by the Engineer.

In clay areas only excavation and shaping to the correct level will be necessary.

PSDM 6 TOLERANCES**PSDM 6.5 Dimensions and level control**

The Contractor shall submit to the Engineer, in a form acceptable to the Engineer, records of dimension and level control, prior to requesting the Engineer to carry out any routine inspections.

PSDM 7 TESTING**PSDM 7.3 Routine inspection and testing**

Substitute DM 7.3.2 with the following:

No density shall be less than the specified minimum density for the relevant layer.

The cost of all routine testing done by the Engineer, and of which the results do not comply with the specified minimum requirement for the material, shall be borne by the Contractor and will be subtracted from the monthly payment certificates.

PSDM 8 MEASUREMENT AND PAYMENT**PSDM 8.3 Scheduled items****PSDM 8.3.3 Preparation of roadbed**

Substitute DM 8.3.3(b)(1) and (2) with the following:

(b) Preparation of in situ roadbed in:

1) Intermediate material	Unit : m ³
2) Hard rock material	Unit : m ³

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSDM 8.3.4 Cut to Fill, Borrow to Fill****Unit: m³**

Substitute "90 %" in DB 8.3.4 with "90 % (100 % for sand)" and "road prism" with "road prism and borrow pits".

PSDM 8.3.7 Cut To Spoil Or Stockpile From**Unit : m³**

Add the following to DM 8.3.7:

Payment for temporary stockpiling shall be made under DM 8.3.11, only if so, instructed in writing by the Engineer.

PSDM 8.3.12 Overhaul**Unit : m³ or m³.km**

Substitute DM 8.3.12 with the following:

The provisions of Clause D 8.3.6 shall apply mutatis mutandis.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSG CONCRETE (Structural) (SANS 1200G)****PSG 3 MATERIAL****PSG 3.2 Cement****PSG 3.2.1 Applicable specifications**

Substitute G 3.2.1 with the following:

Only Ordinary Portland Cement (OPC) and Pulverised Fuel Ash (P.F.A.) shall be used in all concrete for this Contract. No other types of cement (e.g. Rapid Hardening cement, PBFC or Milled Granulated Blast furnace Slag) shall be permitted.

Pulverised Fuel Ash (PFA) shall comply with the following specifications:

- (a) PFA shall be obtained from only one Power Station, from which the PFA has been approved for use in concrete by the SANS.
- (b) All PFA shall comply with the requirements of SANS 1466.1988.

Pulverised Fuel Ash (PFA) shall be used as partial replacement of the Ordinary Portland Cement (OPC) in concrete. The maximum percentage by mass of PFA shall be 33% of the total cementitious material in the concrete, which is defined as the total mass of OPC and PFA, and shall be mixed before delivery to site.

The PFA/OPC Mix shall be stored in the same manner as that specified for OPC. When handled in bulk and stored in silos, the PFA/OPC mix shall require increased silo capacity, more efficient filters and aeration compared to OPC.

PSG 3.2.3 Storage of Cement

Add the following to G 3.2.3:

Separate storage facilities shall be provided for the various types of cement specified. Cement which is stored on the Site shall be kept under a cover that provides adequate protection against moisture and other factors that may aggravate deterioration.

Where the cement is supplied in bags, the bags shall be closely and neatly stacked to a height not exceeding 12 bags, and they shall be so arranged that they can be used in the order in which they were delivered to the Site. Different brands and/or types of the same brand shall be stored separately.

The storage of cement in bulk in silos or similar containers shall be permitted, provided that the cement drawn for use is measured by mass and not by volume.

Consignments of cement shall be used in the same sequence as that in which they are delivered to site. No cement shall be used which has been stored on site for a longer period than 6 (six) weeks. All cement so stored for a longer period than 6 (six) weeks, all cement damaged in any way, and all cement which does not comply with the specification, shall be removed immediately and permanently from the site.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSG 3.4 Aggregates****PSG 3.4.1 Applicable specifications**

Add the following to G 3.4.1:

Fine Aggregate

Fine aggregate shall be clean, coarse, sharp drift, pit or river sand entirely free from vegetable or any other foreign matter and shall be in accordance with SANS 1083 (latest edition). It shall be screened and washed if directed by the Engineer. No dump or crusher sand shall be used.

Samples of fine aggregate proposed to be used are to be submitted to and approved by the Engineer.

Fine aggregate shall be stored on a concrete surface and washed sand shall be allowed to drain for at least 24 (twenty-four) hours before use. The Engineer may require the Contractor to test the sand daily (or more frequently if necessary) for moisture content, impurities and grading before use. Water demand shall not exceed 195 l/m.

Coarse aggregate

Coarse aggregate for concrete shall be hard, non-friable quartzite or other suitable rock, in accordance with SANS 1083 (latest edition) crushed and screened to the specified sizes, of good shape, clean and free from dust.

The maximum size of aggregate shall be 25 mm in floor and walls and 19 mm in roof slab.

Coarse aggregate containing more than 19% (nineteen percent) shale will not be accepted.

Samples of coarse aggregate proposed to be used shall be submitted to and approved by the Engineer. Any broken stone delivered to the site which contains 5% more flaky and/or 10% more elongated particles than the approved sample will be condemned and shall be removed from the site. Voids ratio shall not exceed 47% (forty-seven percent).

PSG 3.5.2 Air-entraining agents

Substitute G 3.5.2 with the following:

Air-entraining agents shall not be used in concrete.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSG 4 PLANT****PSG 4.5.2 Finish**

Add the following to G 4.5.2:

All external corners shall be chamfered by the fixing of fillet strips into the corners of the formwork to form 20 mm x 20 mm chamfers, all at no extra payment.

PSG 4.5.3 Ties

Add the following to G 4.5.3:

Permanent metal ties shall have a minimum concrete cover of 40 mm after formwork has been removed.

Tie holes shall be filled with an approved expansive cementitious grout similar to "Durabed" of ABE. The product shall be prepared to a non-slump consistency, but where no cracking occurs when pressed into a firm ball. Trial mixes shall be made to arrive at the required working consistency.

PSG 5 CONSTRUCTION**PSG 5.1 Reinforcement****PSG 5.1.3 Cover**

Substitute G 5.1.3 with the following:

The cover of concrete over reinforcement, unless otherwise indicated on the drawings, shall in no case be less than 40 mm.

PSG 5.2.1 Classification of Finishes

Add the following to G 5.2.1:

The following surface conditions are required on the various portions of the finished concrete:

(a) Rough

Concealed surfaces and surfaces more than 150 mm below final ground level.

(b) Smooth

All surface finishes not classified as "rough" in paragraph (a) shall be classified as "smooth". All exposed arises (i.e. where the angle between adjacent sides is 110° or less) unless otherwise indicated on the drawings, shall be chamfered 20 mm x 20 mm by means of triangular fillets fixed to the formwork.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**(c) Special smooth, repaired and rubbed**

This shall be for formed surfaces of structures prominently exposed to public view where appearance is of special importance. Formwork shall only be of approved plywood, approved commercial form board or smooth tongue-and-groove boards, except that in certain cases such as for pre-cast units permission may be granted to use steel formwork provided that sufficient vibration is used. After defects have been repaired, as described in paragraph (e), all ridges, nail marks and other projections shall be removed with carborundum stone. After the treatment the surface shall then be kept continuously wet for 10 days after which period of additional curing it shall be allowed to approach surface dryness immediately prior to treatment by sack rubbing in order to secure a degree of suction most favourable for obtaining good bond. A soft mortar consisting of one part cement and two parts sand passing the 1,18 mm sieve shall be thoroughly rubbed over the entire exposed surface with clean hessian, completely filling all pits and irregularities. The mortar consistency shall be that of thick cream. At a sufficient interval after the sack rubbing to prevent smearing, but before the mortar hardens, most of the excess mortar shall be removed by rubbing with clean hessian. After the mortar has set for several hours, curing shall be resumed and continued for at least two (2) days. The surface shall then be allowed to become surface dry and in this condition well sanded with no. 2 sandpaper.

(d) Exposed arises

All exposed arises (i.e. where the angle between adjacent sides is 110° or less) unless otherwise indicated on the drawings, shall be chamfered 20 mm x 20 mm by means of triangular fillets fixed to the formwork.

(e) Repair of concrete

Immediately after the removal of the formwork, the Engineer shall inspect the concrete for defects. Skilled workmen only shall perform all repairs of such defects, by approved methods and to the satisfaction of the Engineer and at the expense of the Contractor.

Repairs shall be carried out as soon as practicable after the removal of the formwork and in any case not longer than twenty four (24) hours after exposure. Concrete that is damaged from any cause and concrete that is honeycombed, fractured or otherwise defective, and concrete which, because of excessive surface depressions must be excavated and built up to bring the surface to the prescribed lines, shall be removed and replaced with mortar or concrete as hereinafter specified or as otherwise directed by the Engineer.

Concrete filling generally of the same class as the damaged concrete shall be used for holes extending entirely through concrete sections and of such a size as will accept concrete and for holes in mass concrete greater in area than 0,1 m² and deeper than 100 mm and for holes in reinforced concrete which are greater in area than 0,15 m² and which extend beyond the reinforcing. Mortar filling composed of sand and cement in the same proportions as used for the concrete and of a consistency such as will make the mortar sufficiently plastic to be easily placed, shall be used for all other imperfections.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



A filling shall be bonded tightly to the surface of the area being repaired and shall be bound and free from shrinkage, cracks and hollow areas after the filling has been cured and dried. Curing of repaired areas shall be performed in such a manner and for such periods as the Engineer may direct.

Particular care shall be exercised to ensure that the colour of the repair work shall match as nearly as possible to the colour of the surrounding concrete. No cement washing or plastering shall be carried out except on the written instruction of the Engineer.

PSG 5.2.2 Preparation of formwork

Add the following to this Sub-Clause:

The joints between continuous formwork elements shall be closely butted and, where necessary, if undue leakage is expected, the joints shall be caulked, taped or packed with a sealing gasket, all at no extra payment. Paper, cloth or similar materials shall not be used for this purpose.

PSG 5.2.5 Removal of formwork

In Table 2 of G 5.2.5.2, substitute "Portland cement and Portland cement 15" in columns 2, 3 and 4 with "CEM 1 Portland cement, delete columns 5 to 10.

PSG 5.4 Pipes and conduits

Add the following to G 5.4:

All pipes and specials, which must be installed in the floors and walls of structures, shall be embedded in the concrete during the casting of such concrete. No holes shall be left for the later installation of pipes and specials, without the written approval of the Engineer.

Where such holes have been approved by the Engineer, the Contractor shall be responsible for the grouting-in of such pipes or specials with an approved expansive cementitious grout as specified in PS G 4.5.3, regardless of whether or not these have been supplied by himself. The Contractor shall provide a smooth, dense and waterproof finish around the pipes or specials.

The clear space between pipes of any kind embedded in reinforced concrete and the clear space between such pipes and reinforcement shall at any point be not less than –

- (a) 40 mm, or
- (b) 5 mm plus the maximum size of coarse aggregate, whichever is the greater.

PSG 5.5 Concrete

PSG 5.5.1.2 Consistency

Add the following under Sub-Clause 5.5.1.2(a):

The slump for concrete to be used in water retaining structures shall not be less than 30 mm and not more than 60 mm.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSG 5.5.1.3 Workability**

Add the following to this Sub-Clause:

The concrete mix to be used in water retaining structures shall have a water/cement ratio not exceeding 0,5.

PSG 5.5.1.5 Durability

Substitute G 5.5.1.5 with the following:

Concrete shall be so proportioned to ensure that the water/cement ratio does not exceed 0,5 and, to ensure workability, water-reducing admixtures of approved manufacture shall be used in preference to increase the cement content.

PSG 5.5.1.7 Strength concrete

Add the following to G 5.5.1.7:

The concrete mix shall be designed by a specialist organization. No concrete shall be placed until the Contractor's concrete mix design has been approved by the Engineer. The concrete shall have a minimum cement content of 420kg/m³. The Contractor shall submit to the Engineer a statement of the mix proportion proposed, together with a report from the specialist organization, showing the 28-day concrete strength obtained when using the material proposed for the work. The cost of the concrete mix design shall be borne by the Contractor and shall be deemed to be included in the rates for concrete work.

Admixtures may be used to increase the workability of the concrete but only with the express approval of the Engineer and when the details of the active ingredients of the admixture and their effects are supplied to the Engineer for approval before use. No additives likely to impair low permeability of the concrete will be approved. Calcium chloride or admixtures containing chlorides may not be used in concrete for water retaining structures. Other admixtures and constituents may only be used with the approval of, or as specified by the Engineer.

The grade of strength concrete and the maximum nominal size of coarse aggregate for each portion of the works, unless otherwise indicated on the drawings, shall be as follows:

- (a) Mass concrete under floors and foundations 20 MPa/19 mm
- (b) Blinding layers 20 MPa/19 mm
- (c) Encasing of pipes 20 MPa/19 mm
- (d) Strip foundations 20 MPa/19 mm
- (e) Benching and screeds 20 MPa/10 mm
- (f) All Reinforced concrete 35 MPa/19 mm
- (g) All water retaining concrete 35 MPa/19 mm

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSG 5.5.7 Construction Joints**

Add the following to G 5.5.7.1:

Construction joints shall be limited to the minimum and shall only be made in positions as shown on the drawings or in positions as specifically approved by the Engineer. Construction joints between tank bottoms, floors, or wall bases, and the walls standing on them shall not be made flush with the supporting surface, but shall be made in the wall 150 mm above the base. The 150 mm high riser wall shall be cast as an integral part of the bottom, floor or base, i.e., the concrete in the riser shall be deposited simultaneously with the concrete in the bottom, floor or base adjacent to it. Where there is a fillet at the bottom of a wall, the construction joint shall be made 150 mm above the fillet.

A PVC waterstop without centre bulb shall be installed at all construction joints in walls of water retaining structures. The size of the waterstops shall be 150 mm in walls thinner than 200 mm and 200 mm in walls of 200 mm thickness and more, or as indicated on the drawings.

PSG 5.5.7.4 Expansion joints

Expansion joints shall be formed in positions and in accordance with details as shown on the drawings. All expansion joints shall be formed with an approved closed cell polyethylene fill material with a density of not less than 100 kg/m³, or as otherwise specified. Joint sealers shall consist of a two-component polyurethane sealing compound complying with SANS 1077. Rearguard S-type PVC water stops with centre bulbs shall be installed under floors and Hydrofoil PVC water stops with centre bulbs in walls, as shown on the drawings.

All sealants, fill material and waterstops shall be installed strictly in accordance with the specification of the manufacturers and to the satisfaction of the Engineer. The sealant shall be installed in one operation and jointing to already hardened sealant will not be permitted.

All expansion joints shall be provided with approved bond breaker tape between the fill material and the sealant.

PSG 5.5.7.4.1 Filled Joints

Filled joints shall be accurately formed to the dimensions shown and with the filler material specified on the Drawings. The filler shall be secured in position so that it will not be displaced during or after concreting if the filler is to remain permanently in the joint.

Wherever polystyrene or a similar material which is susceptible to damage is used to form joints, it shall be lined with a hard surface on the side to be concreted. The hard surface shall be sufficiently resilient to ensure that the joint and surfaces can be formed free from defects.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PSG 5.5.7.4.2 Sealing of Joints

(a) General

Sealed joints shall be made watertight over the full length of the joints, unless otherwise permitted by the Engineer, and the joint dimensions shall be as shown on the Drawings.

(b) Preparation of joints

The reaming of joints by sawing or other means shall be undertaken when edge spalling or ravelling can be avoided and shall be subject to the Engineer's approval. After removal of the temporary filler material or the breaking-out of the excess concrete, the inside faces of the joint shall be wire-brushed or grit-blasted to removal all laitance and contaminants. Thereafter the joint shall be cleaned and blown out with compressed air to remove all traces of dust. Solvents shall not be used for removing contaminants from concrete and porous surfaces.

Care shall be taken to ensure that primers or adhesives are applied only to surfaces that are absolutely dry. The primer or adhesive shall be applied strictly in accordance with the manufacturer's instructions. Unless otherwise specified, the primer shall be applied within the temperature range of 10°C to 40°C and the sealant shall be applied after the curing period of the primer and within the period during which the primer remains active.

(c) Sealants

Sealants shall be applied strictly in accordance with the manufacturer's instructions by a person skilled in the use of the particular type of sealant. The trapping of air and the formation of voids in the sealant shall be avoided. The sealant shall be finished to a neat appearance flush with the edges of the concrete or to the specified depth.

Thermoplastic hot-poured sealants shall not be poured into the joints when the temperature of the joint is below 10°C. The safe heating temperature shall not exceed the specified pouring temperature by more than 10°C.

Two-part thermosetting chemically curing sealants shall not be applied after expiry of the specified potlife period, which shall commence once the base and activator of the sealant have been combined.

(d) Waterstops**General requirements**

The waterstops shall be supplied in unjointed standard production lengths. Site jointing shall be limited to the absolute minimum. Where lengths in excess of the standard production lengths are required, such longer lengths shall preferably be factory jointed.

At intersections, transitions and abrupt changes of direction, factory-moulded watertight junction pieces shall be used so that any site jointing can be restricted to simple joints. When a waterstop with a centre bulb is intersected, the centre bulb

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



shall be continuous throughout the intersection irrespective of the make-up of the intersection.

Plasticized, flexible PVC waterstops shall be manufactured from high-quality virgin material and shall not contain any scrap or reclaimed material. The waterstops shall be light coloured so as to reduce heat absorption when exposed to sunlight.

The waterstops shall be precision moulded or extruded to the required cross-sectional profile, they shall be free from porosity or other imperfections, and shall be provided with eyelets so that they can be securely fixed to prevent displacement during concreting.

All joints shall be butt-jointed hot-welded joints. Where joints cannot be factory made, Site joints shall be made in accordance with the manufacturer's instructions with equipment prescribed or supplied by the manufacturer and approved by the Engineer.

PSG 5.5.9 Adverse Weather Conditions

Add the following to G 5.5.9.1:

No material having a temperature of below 5 °C shall be used for concrete, and no concrete shall be deposited when the ground or air temperature is below 2 °C. Furthermore, if the air or ground temperature is likely to fall below 2 °C within 12 (twelve) hours after depositing of concrete, no concreting shall be done without the written consent of the Engineer. If such consent is given the Contractor shall heat the aggregate stockpiles and mixing water, and defrost the formwork and reinforcement.

PSG 5.5.10 Concrete Surfaces

Add the following to G 5.5.10.1:

Concrete surfaces under screeds, granolithic floor finishes or benching, and surfaces of strip foundations and footings shall be brought up to a plane, uniform surface with a suitable screed board.

Add the following to G 5.5.10:

PSG 5.5.10.4 Wood-floated finish

Where wood floating is specified or scheduled, the surface shall first be given a finish as specified in G 5.5.10.1 and after the concrete has hardened sufficiently, it shall be floated to a uniform surface free from trowel marks. The screeded surface shall be wood-floated, either by hand or machine, only sufficiently to produce a uniform surface free from screed marks.

PSG 5.5.10.5 Steel-floated finish

Where steel floating is specified or scheduled, the surface shall be treated as specified in PS G 5.5.10.4 except that, when the moisture film has disappeared and the concrete has hardened sufficiently to prevent laitance from being worked to the surface, the screeded surface shall be steel-trowelled under firm pressure to produce a dense, smooth, uniform surface free from trowel marks.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSG 5.5.11 Watertight Concrete**

Add the following to G 5.5.11:

All structures shall be deemed to be water retaining, unless otherwise specified.

PSG 5.5.11.1 Requirements and tests for water tightness of structures

The completed structure shall be watertight, and the quality and finish of the work shall be such that no after-treatment of the work such as plastering or cement wash is necessary to ensure compliance with this requirement.

The works will not be certified complete until the structures enumerated in PS G 5.5.11 has been proved by testing to be watertight.

Upon completion of construction and when so agreed by the Engineer, the structure shall be filled by the gradual admission of water until the water level reaches the designed maximum level. The water level shall then be carefully noted and recorded by the Engineer in relation to a fixed benchmark, and the structure shall be allowed to remain filled for a period of 2 (two) weeks or such longer time as may be required to permit complete saturation of the concrete. During this period, readings will be taken by the Engineer and the results so obtained will be available for the information of the Contractor.

At the end of this period more water shall be added, if necessary, to bring the water level back to the designed maximum level and the water shall be left undisturbed for a period of at least 4 (four) days during which time the level shall again be recorded by the Engineer at regular intervals. The structure shall be considered to be watertight if the drop in water level does not exceed 6 mm in 96 (ninety-six) hours in the case of a roofed structure and if no leakage is apparent.

The acceptable drop in level in the case of an unroofed structure shall be such that it allows for normal evaporation during the time of the test.

If appreciable leakage is evident at any stage of the filling or testing or if, in the opinion of the Engineer, the degree of water tightness is unsatisfactory, the Contractor shall, when so ordered by the Engineer, discontinue the test immediately and at his own expense take approved steps to rectify the work. The work of rectification shall be continued assiduously until, on repetition of the test procedure, a satisfactory test result is obtained and the degree of water tightness is acceptable.

Backfilling around structures shall not commence until a satisfactory test result has been obtained.

The Engineer shall have the right to retest the structure before the expiry of the defects liability period and the results of these tests will be made available to the Contractor. If these tests indicate to the Engineer that the degree of water tightness is unsatisfactory, the Engineer (before issuing the final certificate) will be entitled to order the Contractor to rectify the work at his own expense in such a manner as will cause least interruption of the water supply to consumers and will ensure that the degree of water tightness of the structure is satisfactory.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSG 5.5.13 Grouting**

Add the following to this Sub-Clause:

PSG 5.5.13.1 Materials

- (a) Water. Water for grout shall comply with the requirements given in Sub-Clause 3.3 of SANS 1200 G.
- (b) Aggregates. Notwithstanding the requirements of Sub-Clause 3.4.1 of SANS 1200 G, the grading of fine aggregate (sand) and coarse aggregate (stone or pea gravel) shall conform to the gradings given in Tables 1 and 2, respectively, below.
- (c) Cement. Cement shall be ordinary Portland cement complying with SANS 471.
- (d) Admixtures. Admixtures shall comply with the requirements of Sub-Clause 3.5 of SANS 1200 G and shall have a proven record of satisfactory performance under conditions encountered in the Republic of South Africa.
- (e) Proprietary grouting materials. Unless otherwise approved by the Engineer, proprietary grouting materials shall be obtained ready mixed in sealed pockets as supplied by the manufacturers.

TABLE 1 - SAND		TABLE 2 - STONE OR PEA GRAVEL	
1	2	1	2
Test sieve nominal aperture size, mm	% Passing (by mass)	Test sieve nominal aperture size, mm	% Passing (by mass)
9,75	100	9,5	100
4,75	95 - 100	4,74	95 - 100
1,18	45 - 65	2,36	0 - 5
0,3 (300 µm)	5 - 15		
0,15(150 µm)	0 - 5		

PSG 5.5.13.2 Preparation and procedures

- (a) Before a machine or structural bedplate is placed on the concrete the following steps shall be carried out:
 1. All defective concrete, laitance, dirt, oil, grease, and loose material shall be removed from the concrete foundation by bush-hammering, chipping, or other means until sound clean concrete is obtained. The surface of the foundation shall be scabbled, but shall not be so rough as to interfere with proper placing of the grout. All foundation bolt sleeves shall be cut out, or cut off flush if the sleeves cannot be removed. The top of the foundation shall be re-shaped if necessary.
 2. The underside of each steel base, particularly in the bearing areas, shall be cleaned and any burrs and ragged edges removed before the base is placed in its final location.
 3. All holding-down bolt sleeves shall be thoroughly cleaned of any materials that may prevent the grout from flowing freely to the bottom of the bolt sockets.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- (b) The base shall be properly aligned and levelled and shall be maintained in that position during grouting.
- (c) After the machine or structural bedplate has been placed the following precautions shall be observed:
 1. Shimming shall be kept to a minimum. Steel plates shall be used for packing and shall be ground to the required thickness, where necessary.
 2. Before grouting is started all loose dirt, oil, grease, and other foreign matter on the surface of the foundation, the undersides of bedplates, and in the bolt holes shall be removed by means of compressed air or other approved means. The surface of the foundation slab shall be thoroughly saturated with clean water, and all free water shall be removed from the surface and the bolt holes just before the grout is placed.
 3. Grouting shall not be carried out until the alignment of all units to be grouted has been checked and approved by the Engineer.
 4. Special care shall be taken with grouting in hot or cold weather to ensure proper setting and gain of strength and, in the case of proprietary grouting materials, by having ice or hot water available, as the case may be, in accordance with the instructions of the manufacturer. Enclosures shall be provided for the grout such that, until it has set, its temperature will be in the range 15-27°C.

Shields to protect the grout from the sun and from hot winds shall be provided by the Contractor when so ordered.

PSG 5.5.13.3 Formwork

Formwork for grouting shall comply with the applicable requirements of Sub-Clause 5.2 of SANS 1200 G. Forms shall be caulked where necessary. Adequate clearance between forms and bedplates shall be provided to enable the grout to be worked into place.

PSG 5.5.13.4 Mixing (all free-flowing grouts except epoxy grouts).

The grout shall be mixed to a homogeneous uniform mixture and delivered ready for placing at a temperature between 15°C and 25°C.

The materials and water shall be mixed in a mortar mixer for at least 3 min. or, in the case of small jobs only, shall be thoroughly mixed by hand, the entire mass being turned over enough times to ensure even distribution of its components.

The mixing shall be done as close as possible to the place(s) where the grout is placed. No more grout shall be mixed at any one time than can be placed in a period of 20 min. After the grout has been mixed it shall not be retempered by the addition of water.

PSG 5.5.13.5 Grouting (all free-flowing grouts except epoxy grouts)

The grout shall be placed quickly and continuously to avoid the undesirable effects of over-working. (These effects are segregation, bleeding, and breaking-down of initial set). The method of placement shall be subject to approval. The means of placing the grout shall be such that the grout will completely fill the space to be grouted, will be thoroughly

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



compacted, will be free of air pockets, and will have evenly distributed contact over an area in excess of 80% or, in the case of expanding grout, 95% of the bearing area of the item to be supported.

Wherever practicable, grout shall be placed from one side only and where this is not practicable, care shall be taken to ensure that any entrapped air is released.

After the grout has taken its initial set,

- (a) the forms shall be removed;
- (b) excess grout shall be so cut away as to leave a smooth and neatly finished job;
- (c) except where the grout is intended to provide resistance to side thrust, all edges shall be trimmed at 45° to the vertical, from the bottom edge of the bedplate; and
- (d) all excess grout on or about the bedplates shall be removed.

Damage to paintwork, if any, shall be repaired within 24 hours. Packing plates, shims, and other levelling devices shall remain in position.

PSG 5.5.13.6 Dry-packed grout (standard dry sand and cement grout)

Dry-packed grout shall have a minimum compressive strength at 28 d of 20 MPa. The quantity of water added after placing shall be kept to a minimum consistent with placing conditions, and the cement, sand and, where applicable, pea gravel proportions by mass shall be as follows:

- (a) Where the clearance between bedplate and foundation is 25 mm or less: 1 part of Portland cement and 2 parts of sand;
- (b) Where the clearance exceeds 25 mm: 1 part of Portland cement, 1 part of sand, and 1 part of pea gravel.

Dry-packed grout shall be rammed by means of tamping rods against formwork placed along three sides of the bedplate.

PSG 5.5.13.7 Non-shrink grout with metallic aggregate

The manufacturer's instructions shall be observed when non-shrink grout with metallic aggregate is used.

Where the clearance between the bedplate and the foundation is less than 50 mm a sand-based mix shall be used. Where the clearance exceeds 50 mm the Engineer may order a mix with a base of sand plus pea gravel to be used.

PSG 5.5.13.8 Expanding grout with powdered aluminium additive

The manufacturer's instructions shall be observed when an expanding grout with powdered aluminium additive is used. Where the clearance between the bedplate and the foundation is less than 25 mm, a sand-based mix shall be used.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Where the clearance exceeds 25 mm the Engineer may order mix with a base of sand plus pea gravel to be used.

Each batch shall be mixed for at least 6 min. after the powdered aluminium has been added. Where a ready-mixed grout is used, the powdered aluminium shall be added at the placing site and the batch mixed as specified in PSG 9.4. Grout shall be placed within 45 min. after the addition of the powdered aluminium.

The Contractor shall not use powdered aluminium additive when the ambient temperature is below 5°C.

PSG 5.5.13.9 Epoxy grout (epoxy mortar type only)

The manufacturer's instructions shall be observed when an epoxy grout is used.

PSG 5.5.13.10 Testing (Clause 7)

The Contractor shall, where so ordered, carry out a site test for each grouting procedure and each grouting gang to be used. The tests shall be carried out on a dummy bedplate similar in configuration to that which is to be grouted, but not exceeding 1 m in area unless otherwise ordered.

When the dummy bedplate is dismantled, the underside shall show a minimum grout contact area of 80% with reasonably even distribution of the grout over the surface grouted except that, in the case of expanding grout, the minimum grout contact area shall be 95%. The test shall show evidence of good workmanship and materials and the results shall be to the satisfaction of the Engineer.

The Contractor shall, when so ordered, make standard test cubes from various grout mixtures and subject them to compression tests to determine whether the specified strength has been achieved. Test procedures shall comply with the relevant requirements of Sub-Clause 7.2.1 to 7.2.3(f) SANS 1200 G.

PSG 5.6 Screed in circular sedimentation tanks

No screeding of circular sedimentation tank floors shall be allowed unless agreed to by the Engineer. In this case, the contractor shall consult with the Mechanical Contractor, before application of the screed, to obtain advice on the use of the scraper mechanism for a smooth finish to the screed.

PSG 5.8 No-fines concrete

PSG 5.8.1 Materials

Cement shall be CEM II.

Water and aggregate shall comply with the requirements of G 3.3 and G 3.4.

Each size of aggregate shall be a single size aggregate graded in accordance with SANS 1083.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSG 5.8.2 Classes of no-fines concrete**

No-fines concrete shall be classified by the prefix NF and the size of aggregate to be used. Class NF 19 means a no-fines concrete with a 19 mm nominal size aggregate.

The volume of aggregate per 50 kg of cement for each class of concrete shall be as follows:

CLASS	AGGREGATE PER 50 kg CEMENT
NF 38	0,33 m ³
NF 19	0,30 m ³
NF 13	0,27 m ³

PSG 5.8.3 Batching and mixing

Cement shall be measured by mass or in full pockets of 50 kg each and aggregate shall be measured by volume in approved measuring boxes or barrows.

The aggregate shall be moist or wetted before the cement is added. Where drum mixers are used, about 20 % of the water shall be poured into the drum before the aggregate and cement are loaded. The mixing time in the drum shall be about 45 to 50 seconds.

The quantity of water added shall be just sufficient to form a smooth grout which will adhere to and completely coat each and every particle of aggregate, and which is just wet enough to ensure that, at points of contact of aggregate, the grout will run together to form a small fillet to bond the aggregate together. The mix shall contain no more than 20 litres of water for every 50 kg of cement.

Mixing shall be done in an approved batch-type mechanical mixer, but small quantities may be hand mixed.

PSG 5.8.4 Placing

No-fines concrete shall be placed in accordance with the procedure approved by the Engineer. It shall be placed in its final position within 15 minutes of having been mixed.

The concrete shall be worked sufficiently to ensure that it will completely fill the space to be concreted and that adjacent aggregate particles are in contact with one another. Excessive tamping shall be avoided and the concrete shall not in any circumstances be vibrated.

PSG 5.8.5 Protection

All no-fines concrete shall be protected from the elements and loss of moisture. Protection against loss of moisture shall be accomplished by one or more of the following methods

- (a) Retaining formwork in place;
- (b) Covering exposed surfaces with sacking or other approved material kept continuously wet;

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- (c) Covering exposed surfaces with plastic sheeting.

No-fines concrete placed during cold weather shall be adequately protected against frost for at least three (3) days.

PSG 5.9 Joining new concrete to existing

Where partial demolition is required for extension work to existing structures, the contact face shall be cut to predetermined line and level, and any loose and fragmented material shall be removed, and projecting steel cleaned and bent as directed by the Engineer. Where partial demolition is not required but extension work only, the contact surface shall be scabbled and cleaned of all dirt and loose particles.

If dowels are required, they shall be installed in holes drilled into the existing structure, in accordance with the details shown on the drawings, and secured by means of an approved type of epoxy bonding compound such as Epidermix 372 or similar.

Fresh concrete shall be bonded to the old concrete with an approved type of epoxy bonding compound, such as Epidermix 344 or similar.

PSG 6 TOLERANCES

PSG 6.2.2 Concrete Surfaces

Add the following to G 6.2.2:

The top surface of the circular sedimentation tank walls shall be finished to Degree of Accuracy I in G 6.2.3(d)7, but there shall be no abrupt changes in the continuous surface. Deviations shall be measured as set out in G 6.1.2(a).

PSG 8 MEASUREMENT AND PAYMENT

PSG 8.1 Measurement and rates

PSG 8.1.1 Formwork

Delete "or the plan size of the excavation where additional excavation is provided to facilitate erection of forms" in the first sentence of PS G 8.1.3.1(c).

Delete the following in G 8.1.1.3(c):

"and for different prop heights for beams and slabs".

PSG 8.1.3 Concrete

Delete "or the plan size of the excavation where additional excavation is provided to facilitate erection of forms" in the first sentence of PS G 8.1.3.1(c).

Add the following to PS G 8.1.3.1(d):

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Strip foundations and encasement of pipes shall be cast directly against the sides and bottoms of excavations. No payment shall be made for additional concrete in over-break.

Delete the full stop at the end of G 8.1.3.3(a) and add the following:

"And special steps necessary before depositing concrete during cold weather, as prescribed in PS G 5.5.9".

PSG 8.2 Scheduled formwork items

PSG 8.2.5 Narrow Widths **Unit: m**

Substitute G 8.2.5 with the following:

Narrow widths of formwork shall not be measured separately, but shall be included in G 8.2.1 and G 8.2.2, as applicable, unless a specific item has been allowed for in the schedule of quantities.

Add the following to G 8.2:

PSG 8.2.7 Chamfers exceeding 20 mm x 20 mm, grooves and rebates **Unit: m**

The size of chamfers, or the width and depth in the case of grooves and rebates, is stated.

PSG 8.4 Scheduled concrete items

PSG 8.4.4 Unformed Surface Finishes **Unit: m²**

Add the following to G 8.4.4:

The concrete surface finishes under screeds, granolithic finishes or benching as prescribed in PS G 5.5.10 shall not be measured separately. The rates for the related concrete items shall also cover the cost of these surface finishes.

PSG 8.4.7 Concrete complete with formwork and/or trowel finish **Sum or m³**

The rate shall cover the cost of the provision of concrete (made from ordinary Portland cement, unless otherwise scheduled), mixing, testing, placing, compacting, the forming of stop-ends and unforeseen construction joints, striking-off or levelling as applicable, trowelling and curing and repairing where necessary, together with the cost of all parts of formwork in contact with the concrete and the necessary bearers, struts, and other supports, plus the layout and plant necessary to erect and strike such formwork.

PSG 8.5 Joints **Unit: m**

Add the following to G 8.5:

Only construction joints with PVC waterstops shall be measured separately. The cost of all other construction joints shall be deemed to be included in the rates for the relevant concrete items.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



The cost of all construction and expansion joints shall include formwork, joint filler and sealer as well as waterstops where applicable.

PSG 8.7 Grouting

Add the following pay items:

- (a) Grouting in of equipment supplied and installed by the Plant Supplier
 - (i) using non-shrink grout (state type) Unit: Cubic metre (m³)
 - (ii) using dry-packed grout Unit: Cubic metre (m³)

The unit of measurement shall be the cubic metre of completed grouting.

The tendered rate shall include full compensation for supplying of all materials, mixing, applying and finishing to a steel-float surface finish after installation of the Plant.

Add the following pay items:

PSG 8.9 Test structure for watertightness Unit: Sum

The rate shall cover the cost of all equipment and labour necessary to test the structure for water tightness as described in PS G 5.5.11.1, including the supply of water and filling such structure.

No additional payment will be made for re-testing the structure for water tightness after the repair of leaks.

PSG 8.10 Building pipes into concrete work and grouting pipes installed by the mechanical contractor Unit: No

The rate shall cover the cost of forming the opening for the pipe, scabbling, cleaning and preparing the concrete surface, providing an approved non-shrink epoxy grout, placing and ramming of it solidly into all voids, formwork and finishing to a smooth watertight surface.

PSG 8.12 Join new concrete to existing

- (a) Partial demolition (describe) Unit: Sum
- (b) Scabbling of existing surface Unit: m²
- (c) Steel dowels Unit: No

The rate for (a) shall cover the cost of partial demolition as described, and of exposing, cleaning, cutting and bending the existing reinforcement, as well as repairing the concrete surface that is to be retained and disposing of waste material.

The rate for (b) shall cover the cost of scabbling the existing surface, as well as the cost of supplying and applying the epoxy bonding compound.

The rate for (c) shall cover the cost of drilling for and supplying and installing the steel dowels, as well as the cost of supplying and applying the epoxy bonding compound.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSG 8.13 Sealing of openings in top surface of no-fines concrete with plaster**

(a) Plane horizontal Unit: Square metre (m²)

(b) Plane sloping Unit: Square metre (m²)

The unit of measurement shall be the square metre of sealing of no-fines concrete.

The tendered rate shall include full compensation for supplying for the construction of the plaster work, including the supply of all material, mixing, applying, finishing to a wood-float finish.

PSHA STRUCTURAL STEELWORK (SUNDRY ITEMS)**PSHA 3 MATERIALS****PSHA 3.1 Structural steel**

The grade of steel shall be 350W.

PSHA 3.3 Bolts, nuts and washers**PSHA 3.3.1 Bolts and nuts (Other than Friction Grip)**

Add the following to this Sub-Clause:

All bolts and nuts shall be of grade 4,3 steel. Washers shall be provided at each nut and shall be of the same material (or coating where applicable) to match the bolt and nut. Single coil square section spring washers shall be fitted to all nuts subject to vibration.

Bolts other than jacking bolts shall project not less than 3 mm and not more than 10 mm from the heads of the nuts after tightening.

Holding down bolts to be built into concrete work as well as bolts to be installed above ground level directly above and under water shall all be of stainless steel grade 304. Bolts for flexible couplings and flanges for underground installation shall be hot-dip galvanized in accordance with the requirements of SANS 763. Bolts to be installed inside buildings shall be hot-dip galvanized in accordance with the requirements of SANS 763.

Suitable plastic sleeves and/or washers shall be used for protection against corrosion by metallic action.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSHA 4 PAINTS AND PROTECTIVE COATINGS**

Unless indicated otherwise corrosion protection to all structural mild steel shall be as follows:

- (a) Surface preparation ISO 8501-1-1989
- (b) Two coats of Carbomastic 15 primer or equivalent
- (c) Two coats of Carboline 134 final coat or equivalent

PSHA 5 CONSTRUCTION**PSHA 5.2 FABRICATION AND ASSEMBLY****PSHA 5.2.6 Handrails**

Substitute the first sentence of HA 5.2.6 with the following:

Handrails shall be of the tube and sphere type similar to Monoweld and shall be manufactured by an approved firm specialising in such works from grade 304 L stainless steel or hot dipped galvanized (heavy duty coating), as scheduled or shown on the drawings.

Handrails shall be 1 000 mm high and shall consist of a handrail and a knee-rail, both manufactured of steel tubing of nominal thickness 2,6 mm and of nominal outside diameter of at least 34 mm.

Stanchions shall be manufactured pre-formed in one piece and shall be of steel tubing of nominal thickness of 2,6 mm and of nominal outside diameter of at least 42 mm. The bases of the stanchions shall be manufactured of 150 mm x 75 mm x 12,5 mm flat bars and shall be pre-formed to suit the situation in which they are to be installed (i.e., for platform- or side-mounting, and for horizontal- or sloped-mounting on concrete or steel), and the stanchion spheres shall be pre-formed to suit right angled or other angled intersections), all as shown on the drawings.

Stanchions shall be spaced at intervals not exceeding 1,5 m and shall be fixed with two M16 bolts, washers and nuts each. All joints shall be welded.

Materials shall be as shown on the drawings or as scheduled.

PSHA 5.2.11 Ladders

Add the following to HA 5.2.11:

Materials shall be as shown on the drawings or as scheduled.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSHA 5.2.12 Prefabricated open grid floors**

Add the following to clause 5.2.12.1:

Open grid flooring shall be of square pattern type of approved manufacture with 40 x 4 mm minimum thickness bearer bars spaced at not more than 40 mm centres and shall be manufactured in grade 304 stainless steel or 3 CR 12 steel (as scheduled or as shown on the drawings). The tendered rate shall include for all cutting into the required panels, banding and for frames detailed below.

Open grid flooring shall be provided with welded frames as scheduled, made of 50 x 50 x 5 mm thick 3 CR 12 steel angle to provide a seating for the open grid flooring. The nett clearance between the side bars of the open steel flooring and the vertical leg of the frame or strip shall be 5 mm per side. The frames shall be complete with 100 x 40 x 3 mm 3 CR 12 steel anchors fixed at 500 mm centres for building the frame into the concrete work.

Pickling and passivation shall be carried out in accordance with the requirements of the Standardized Corrosion and Painting Specification for Civil Engineering Works.

PSHA 5.2.13 Floor plate floors

Substitute HA 5.2.13 with the following:

Materials shall be as shown on the drawings or as scheduled.

PSHA 5.2.14 Ground water pressure relief valves

Ground water pressure relief valves shall be J.K.F. type B or similar approved by the Engineer, 110 mm diameter with 12 mm thick neoprene disc and sealing ring. The body of the valve shall be manufactured from S.G. iron and all bolts and fittings shall be grade 304 stainless steel.

A 110 mm diameter hot dipped galvanized mild steel pipe shall be used as a spacer ring when building the valve into concrete work, all as shown on the Drawing.

The valves must be designed for a water pressure of at least 6 metres and to maintain a flow rate of 320 litres per minute at a differential head of 1,0 metres.

PSHA 5.2.15 Weir plates

Weir plates shall be 6 mm thick and shall be manufactured in 3 CR 12 steel as scheduled or as shown on the drawings. Dimensions and slots for M 10 stainless bolts shall be as shown on the Drawings.

The weir plate shall be fixed to the concrete surface using 8 mm thick neoprene seals.

PSHA 5.2.16 Penstocks

All parts shall be designed for the duty required, but the minimum factor of safety against structural failure shall not be less than 3, based on the working stress of the material. In the design, due consideration shall be given to the thickness of materials with regard to corrosion and operating conditions. The force required at a hand wheel or crank to raise a gate or open a penstock shall be in the order of 100 Newton.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



The frames and gates of penstocks shall be made of grade 304 stainless steel with a thickness suitable for the duty required but shall not be less than 3,5 mm thick.

All gates shall be well guided with no possibility of jamming. The gates of wall mounted types shall be held uniformly against the side facings of the frames by the action of adjustable wedges and shall provide drop-tight closure under the conditions as shown on the drawings. Penstocks (any seating condition) shall not spill water over the top or sides of the frame other than through the opening provided in the penstock for the water to pass through. All penstocks shall be of the level invert type fitted with renewable seals of a non-biodegradable material on the invert.

Penstocks shall have rising spindles protected by suitable transparent nylon sleeves, the latter providing convenient visual inspection and greasing facilities. Hand wheels shall be of cast iron with diameters to suit operating either directly on the head frame or on a grade 304 stainless steel tubular pedestal to suit the installation depth, as shown on the drawings. Where necessitated by the mass of the gate and/or the pressure against the gate, suitable gearing shall be provided.

All penstocks measured in the Schedules of Quantities shall be supplied and installed by the Contractor under this Contract. In the case of penstocks to be fixed against concrete walls, holding down bolts made of 304 stainless steel must be supplied and installed into the concrete work. The Contractor shall also execute the complete grouting of the penstocks and carry out all necessary adjustments to ensure proper and smooth operation of the penstocks.

PSHA 5.2.17 Handstops

All parts shall be designed for the duty required, but the minimum factor of safety against structural failure shall not be less than 3, based on the working stress of the material. In the design, due consideration shall be given to the thickness of materials with regard to corrosion and operating conditions. The force required at the handle(s) to raise a gate or open handstop shall not be more than 200 Newton. Should this not be feasible then the handstop gate is to be cut in more than one part, each with its own handle(s) in order to achieve this limit of 200 Newton per section.

The frames and gates of handstops shall be made of aluminium with a thickness suitable for the duty required but shall not be less than 3,5 mm thick.

All gates shall be well guided in frames purpose made to suit their position and duty and shall provide drop-tight closure under the conditions as shown on the drawings. Handstops shall not spill water over the top or sides of the frame other than through the opening provided in the handstops for the water to pass through. All handstop frames shall be extended to the top of the concrete member concerned. Water tightness of handstops shall conform to the requirement that leakage at full water level will not exceed one litre in 15 seconds.

All handstops shall be supplied and installed by the Contractor under this Contract. The Contractor shall also execute the complete grouting of the handstops and carry out all necessary precautions to ensure proper and smooth operation of the handstops.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSHA 8 MEASUREMENT AND PAYMENT****PSHA 8.3.2 Handrails**

PSHA 8.3.2(b) Handrail assembly complete

Unit: m

Delete the reference to "details given" and add: as specified in Sub-Clause PS HA 5.2.6 (state material to be used).

The tendered rate shall include handrails comprising hand and knee rails installed complete as specified

PSHA 8.3.6 Corrosion Protection

Substitute HA 8.3.6 with the following:

The corrosion protection of sundry steel items shall not be measured separately. The cost thereof shall be included in the rate for the related item.

PSHA 8.3.7 Ground water pressure relief valve**Unit: No**

The unit of measurement shall be the number of ground water relief valves installed.

The tendered rate shall include full compensation for manufacture, supplying, installation and corrosion protection as specified, including 110 mm diameter medium class galvanised mild steel pipe which will be used as a spacer ring when building the valve into concrete work.

PSHA 8.3.8 3CR12 weir plates (state size), (refer to drawings)**Unit: No**

The unit of measurement shall be the number of complete weir plates.

The tendered rate shall include full compensation for manufacture of the weir plates, supplying, installation, including self-drilling M10 anchor bolts, cutting slots in plates for bolts, supplying and installing 8 mm thick neoprene sealing material between concrete and plate and adjusting after installation to obtain the correct level as shown on the drawings.

PSHA 8.3.9 Grade 304L stainless steel penstock**Unit: No**

The tendered rate shall include full compensation for manufacture, supplying, installation of the penstock to suit the position described and shown on the drawings.

PSHA 8.3.10 Aluminium handstops**Unit: No**

The tendered rate shall include full compensation for manufacture, supplying, installation of the handstop to suit the position described and shown on the drawings.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSL MEDIUM PRESSURE PIPELINES (SANS 1200L)****PSL 3 MATERIAL****PS L 3.1 General**

Substitute the first sentence of L 3.1 with the following:

Types and classes of materials shall be as scheduled.

PS L 3.8 Jointing materials**PS L 3.8.4 Loose Flanges**

Substitute the first sentence of the last paragraph of L 3.8.4 with the following:

Bolts and nuts shall comply with the requirements of SANS 135.

PS L 3.11 Manholes and surface boxes**PS L 3.11.4 Step Irons**

Substitute L 3.11.4 with the following:

Step irons shall consist of polypropylene coated 12 mm high tensile steel such as Calcamite or similar. The installation of the step irons shall be in accordance with the specification of the manufacturer.

Add the following sub-clauses after Sub-clause 3.11:

PSL 3.12 Marking of items

All items delivered on Site shall be clearly marked showing the following:

- (a) Nominal diameter,
- (b) Class of pipe,
- (c) Date of manufacture, and
- (d) Reference number as shown in the Schedule of Quantities."

PSL 4 PLANT**PSL 4.3 Testing**

Add the following to L 4.3:

The Contractor must ensure that the test equipment is in good working order and that it is calibrated.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSL 5 CONSTRUCTION**

Add the following sub-clauses after Sub-clause 5.10:

PSL 5.11 Connection into existing main

Before commencing the excavation of pipe trenches in the vicinity of a proposed connection, the contractor shall excavate for, expose, survey and record the position and level of the connection point on the existing water main and shall determine all specials required.

The Contractor shall be responsible, through the Employer's Agent, for liaison with the Municipality to arrange for turning off the water in order to carry out the connection.

The Contractor may cut into the existing water main (where applicable) only after he has received a written instruction from the Employer's Agent to do so. No connection will be allowed on a Friday or after 12h00 on any day.

Before the connection is made, the new pipes must be laid to within 2m of the connecting point, and must be temporarily blanked off, anchored, sterilized and tested. All specials required must be available on site.

The connection to existing pipes shall include the breaking out of anchor blocks (if necessary), and removal of existing pipe fittings and couplings.

PSL 5.12 Replacement of existing valves and pipes

Before commencing with excavation of pipe trenches in the vicinity of the proposed replacement, the contractor shall excavate for, expose, survey and record the position and level of the existing water main and shall confirm all specials required.

The Contractor shall be responsible, through the Employer's Agent, for liaison with the Municipality to arrange for turning off the water in order to carry out the connection.

The Contractor may cut into the existing water main (where applicable) only after he has received a written instruction from the Employer's Agent to do so. No connection will be allowed on a Friday or after 12h00 on any day. All specials required must be available on site.

The replacement of the existing valve and pipe shall include the breaking out of anchor blocks (if necessary), and removal of existing pipe fittings and couplings.

PSL 5.13 Protection of buried joints

The Contractor shall protect all joints with nuts and bolts against corrosion by wrapping them with "Denso" tape or equal approved, in accordance with the manufacturer's instructions.

PSL 5.14 Pipeline route markers

Route markers for the various water pipelines shall be erected in the positions and shall be manufactured according to the details shown on the Drawings."

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSL 7 TESTING****PS L 7.3 Standard hydraulic pipe test****PS L 7.3.1.2 Test pressure**

Substitute L 7.3.1.2 with the following:

The test pressure for field testing shall be 1,5 times the rated maximum working pressure of the pipe e.g. class 4 uPVC pipes shall be tested to 0,6 MPa.

PSL 8 MEASUREMENT AND PAYMENT**PSL 8.2.1 Supply, Lay, and bed pipes complete with couplings**

Add the following after Sub-clause 8.2.1:

"The Contractor will be allowed to claim the following percentages for interim payment purposes as the various activities are completed:

Stage of Completion	Percentage Applicable
Pipes laid and bedded in trench	80%
Pipes tested successfully, cleaned and disinfected	100%

Note that the percentage applicable is given in the above table as a cumulative figure.

PSL 8.2.11 Anchor/Thrust blocks and pedestals

Add the following sub-clauses after Sub-clause 8.2.11 (a):

"The rates for the thrust blocks shall cover the cost of excavation and backfill, concrete, formwork, and steel reinforcement (including 120 kg high tensile steel per cubic metre of concrete where the amount of steel is not indicated on the drawings) as well as labour, etc., to complete the thrust block as shown on the drawings in addition to the operations and materials specified in this sub-clause."

PS L 8.2.16 Cut into existing mains/structure**Unit: No**

The cutting into existing mains and structures shall be measured by the number of each type and diameter of pipe cut into. The rate shall include full compensation for all arrangements with the relevant authorities, isolating the existing service, cutting into the existing service to accommodate the connecting fitting, dewatering, excavating, taking steps to prevent the ingress of soil, stones and other material into the existing service, as well as for any liaison with others required and for making good any damages to the existing service and all material and labour to connect the pipe.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSLB BEDDING (Pipes) (SANS 1200LB)****PSLB 1 SCOPE**

Add the following to LB 1.1:

This specification also covers the bedding required for electric cables.

PSLB 3 MATERIALS**PSLB 3.1 Selected granular material**

Substitute LB 3.1 with the following:

Selected granular material shall be an aggregate, sand or granular material, all of a non-cohesive nature and free from any organic material, of which the grading analysis shows 100 % passing a 13,2 mm sieve and not more than 5 % passing a 0,075 mm sieve.

In very wet conditions and if so ordered by the Engineer, a non-plastic crushed material with the specification as stated underneath should be used for bedding cradle.

a) Grading

Sieve size (mm)	% going through
19,0	100
13,2	84 - 100
9,5	70 - 84
4,75	45 - 65
2,36	29 - 47
1,18	19 - 33
0,600	13 - 25
0,300	10 - 18
0,150	6 - 13
0,075	4 - 10

b) Crusher value

The aggregate crushing value, calculated at minus 13,2 mm plus 0,5 mm fraction, may not exceed 29.

PSLB 3.2 Selected fill material

Substitute LB 3.2 with the following:

The requirements of PS LB 3.1 shall apply mutatis mutandis.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSLB 3.3 Bedding**

Add the following to LB 3.3:

All pipes shall be classified as rigid pipes and shall be laid on a Class C bedding except water connections, which shall be classified as flexible pipes. Cable bedding is specified separately.

PSLB 3.4.1 Suitable material available from trench excavations

Substitute LB 3.4.1 with the following:

The provisos of PS D 3.3.1 shall apply mutatis mutandis.

PSLB 3.5 Bedding in waterlogged conditions

In waterlogged conditions, the Engineer may instruct the Contractor in writing to use a bedding cradle comprising single sized 6,7 mm crushed stone complying with SANS 1083.

PSLB 5 CONSTRUCTION**PSLB 5.1 General****PSLB 5.1.4 Compacting**

Substitute "90 %" in LB 5.1.4 with "93 % (100 % for sand)".

PSLB 5.5 Placing and bedding of cables

Bedding and backfilling for cables shall be executed under this contract. Cables shall be installed by the mechanical contractor.

Machine compaction shall not be carried out directly over cables, unless the cables are covered by at least 300 mm of fill material.

PSLB 8 MEASUREMENT AND PAYMENT**PSLB 8.1 Principles****PSLB 8.1.5 Disposal of displaced material**

Add the following to LB 8.1.5:

The requirements of PS D 5.2.2.3 shall apply mutatis mutandis.

PSLB 8.1.6 Free-haul

Delete the words "of 0,5km" in the first line of this sub-clause.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSLB 8.1.6 Provision of bedding from trench excavation**

Delete the words "from within 0,5km," and "within a freehaul distance of 0,5km" in the first sentence of Sub-clause 8.1.6.

PSLB 8.2.2 Supply only of bedding by importation from borrow pits

Delete the words "within a freehaul distance of 0,5km" in the last sentence of Sub-clause 8.2.2.

Add the following to LB 8.2:

PS LB 8.2.6 Supply and place bedding material for cables, from

(a) Trench excavations	Unit: m ³
(b) Other excavations	Unit: m ³
(c) Borrow pits	Unit: m ³
(d) Commercial sources	Unit: m ³

Bedding and selected fill for cables shall not be measured separately.

No differentiation shall be made between trenches, bedding and backfilling for cables to be installed by the Contractor or the mechanical contractor.

**PSLB 8.2.7 Extra over items 8.2.1 and 8.2.2 for bedding
stabilized with 5% cement**

Unit: m³

The rate shall include full compensation for selecting, mixing, backfilling and compacting the stabilized material to 90% of modified AASHTO dry density."

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSLC CABLE DUCTS****PSLC 3 MATERIALS****PSLC 3.1 Ducts**

Add the following to LC 3.1:

Class 6 uPVC pipes (dia 110 mm or 160 mm) shall be used as ducts for electric cables under roads and paved areas.

PSLC 3.2 Bedding

Substitute LC 3.2 with the following:

The provisions of SANS 1200 LB : Bedding (Pipes) and the relevant project specification shall apply mutatis mutandis and payment shall be made under the appropriate payment clauses of SANS 1200 LB.

PSLC 3.3 Backfill

Substitute LC 3.3 with the following:

The provisions of SANS 1200 DB: Earthworks (Pipe Trenches) and the relevant project specification shall apply mutatis mutandis and payment shall be made under the appropriate payment clauses of SANS 1200 DB.

PSLC 3.4 Cable duct markers

Add the following to LC 3.4:

Cable duct markers shall be provided as specified in LC 5.10.

PSLC 5 CONSTRUCTION**PSLC 5.1 Excavation of trenches****PSLC 5.1.1 Trench Widths and Depths**

Add the following to LC 5.1.1:

Trench widths shall be in accordance with the provisions of SANS 1200 DB: Earthworks (Pipe Trenches).

The minimum depth of cover over ducts shall be 600 mm from the final road level or the finished ground level.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSLC 5.1.3 Excavation of trenches at road crossings**

The minimum depth of cover over ducts shall be 300 mm where construction traffic is liable to cross them. Road crossings shall therefore be constructed after the construction of the roadworks has reached the stage where the required cover is available.

PSLC 5.2 Bedding and compaction of bedding

Substitute LC 5.2.1 and LC 5.2.2 with the following:

All ducts shall be laid on a Class C bedding according to the provisions of SANS 1200 LB: Bedding (Pipes). Backfilling shall be according to the provisions of SANS 1200 DB: Earthworks (Pipe Trenches).

PSLC 5.4 Backfilling and compaction

Add the following to LC 5.4:

Road crossings shall be backfilled with sand (stabilised with 5 % cement by volume) from designated borrow pits, the site or commercial sources, whichever is applicable, up to underneath the subbase, and compacted to a minimum of 100 % of MAASHTO density.

PSLC 5.8 Road crossings

Substitute "0,5 m" in the last sentence of LC 5.8 with "1,0 m" and add the following:

Ducts for road crossings shall be effectively sealed by means of end caps.

PSLC 8 MEASUREMENT AND PAYMENT**PSLC 8.2 Scheduled items****PSLC 8.2.8 Cable markers****Unit: No**

Substitute LC 8.2.8 with the following:

The rate shall also cover the cost of the end cap and the incisions, concrete marker and draw wire, as specified in LC 5.10.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSLD SEWERS (SANS 1200 LD)****PSLD 1 CAMERA EQUIPMENT FOR LEAK DETECTION**

The following equipment and personnel is required for the proper functioning of inspections for existing sewer systems.

- a) iPek Rovver RC90 zoom camera (or similar approved) for sewer lines between 100 mm and 600 mm diameter as well as the determination of grades in the existing lines.
- b) The software required is WinCam mobile with MPEG encoder, inclination module and Viewer expert and show and media distribution facilities.
- c) Computer with a minimum of 80GB hard drive, DVD writer, Windows XP, Microsoft Access with two external hard drives (250 GB each) as well as a compatible colour printer.
- d) A 2kva "Generator" must be supplied.
- e) A UPS to stabilise the computer equipment
- f) The above items must be installed in a motor vehicle with sufficient space for a person to control the camera equipment and do the necessary recordings in the vehicle.
- g) The person who is responsible for the control of the camera must have the necessary experience in sewer systems and be in possession of a National Diploma in Civil Employer's Agenting as well as being computer literate.
- h) The vehicle must also be equipped with a ladder as well as warning signs and sufficient cones for erection while working in restricted areas.
- i) A mass store facility for data must be provided for at an approved data mass storage bank.

PSLD 1.1 MEASUREMENT AND PAYMENT – CAMERA EQUIPMENT

- a) Fixed Cost.....Lump Sum (specified in bill)

The tender lump sum under item a) shall be in full compensation for providing the equipment, the complete service or installation and the use thereof.

- b) Overheads, charges and profit on item a)% Specified in the bill
- c) Time related...../Month

The tendered rate per month for sub item PSLD3.1 (b) represents full compensation for that part of the contractor's obligations which are mainly a function of construction time. The tendered rate will be paid monthly, pro rate for parts of a month, from the date on which the contractor has received the letter of acceptance, until the end of the period of completion of the works, plus any extension thereof as provided in clause 8.4 of the General Conditions of Contract.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSLD 2 COMPUTER SOFTWARE FOR THE EMPLOYER'S AGENT**

The tenderer must allow for the purchasing of two full packages of the WinCam Viewer software for the sole use by the consultants for the full duration of the project.

PSLD2.1 MEASUREMENT AND PAYMENT – COMPUTER SOFTWARE

Add the following:

- a) Computer software for the Employer's Agent..... Lump Sum

PSLD 3 MATERIALS**PSLD 3.1 Pipes, fittings, and pipe joints****PSLD 3.1.5 uPVC-pipes**

Substitute "approved flexible joints" in LD 3.1.5 with "spigot and socket rubber ring joints".

PSLD 3.5 Manholes, chambers, etc.**PSLD 3.5.7 Step Irons**

Substitute LD 3.5.7 with the following:

Step irons shall be installed in all manholes deeper than 1,2 m. Step irons shall consist of polypropylene coated 12 mm high tensile steel, such as Calcamite or similar. The installation of the step irons shall be in accordance with the specification of the manufacturer.

PSLD 5 CONSTRUCTION**PSLD 5.6 Manholes, inspection chambers, etc.****PSLD 5.6.1 General**

Substitute LD 5.6.1(a) with the following:

Manholes shall be of precast concrete sections with an inside diameter of at least 1 000 mm and shall be constructed as shown on the drawings bound into the document.

1. Final cover levels of manholes in roads and paved areas shall be to the same level as the road or paved area.
2. In the veld 100 mm above natural ground level.

If a manhole is positioned at a low point or in a hollow where stormwater infiltration may occur, the manhole cover level must be raised to a level to avoid the danger of infiltration, or to a level as agreed with the Engineer.

If the manhole needs to be raised with more than 300 mm, precast concrete sections with the same diameter shall be installed and sealed with epoxy.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PSLD 5.6.2 Benching**

Add the following to LD 5.6.2.3:

Benching for all manholes except those with sand traps shall be in accordance with the drawings bound into the document.

PSLD 5.6.3 Step irons

Add the following to LD 5.6.3:

Step irons shall only be installed in manholes deeper than 1,2 m.

PSLD 5.6.4 Brick manholes

Add the following to LD 5.6.4.3:

Walls of brick manholes, as well as the extension of precast manholes above the concrete roof slab, shall be plastered internally. External plasterwork shall extend to at least 150 mm below ground level. Manholes shall not be extended above the concrete roof slab by more than 300 mm with brickwork.

If manhole covers are raised with bricks, a half-brick recess, as a foothold, shall be left directly below the concrete slab above the step irons.

PSLD 7 TESTS**PSLD 7.1 General**

Add the following to LD 7.1.5:

All tests shall be repeated after the completion of backfilling of pipe trenches.

PSLD 8 MEASUREMENT AND PAYMENT**PSLD 8.2 Scheduled items****PSLD 8.2.3 Manholes**

Add the following to LD 8.2.3:

Manholes shall be measured complete as indicated on the drawings and the rate shall be all inclusive for benching, step irons, type 4A CI cover and frame, and it shall make provision for all additional excavation and backfilling.

The depth of manholes as mentioned in the schedule of quantities, shall be measured from the final cover level to the outlet invert level (flow level).

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSLD 8.2.3.3 New manholes on existing pipes****Unit: No**

The tendered rate shall be all inclusive for the handling of sewage flow, all excavation and backfilling, cutting of pipe and supply and installation of the new manhole, complete as described in LD 8.2.3.1, with finish and benching to accommodate the level difference of approximately 200 mm.

PSLD 8.2.11 Connection to existing sewers**Unit: No**

Add the following to LD 8.2.11:

Separate items will be scheduled for each diameter of connecting pipe.

The tendered rate shall include full compensation for connecting the proposed pipe, any additional channelling and benching associated with the connection, cutting the pipe to suit the connection, supplying and building in the short junction pipe, extra couplings, dealing with existing flow, preventing foreign material from entering the sewer and making the connection.

The excavation for pipelines, pipes, backfilling and manholes shall be measured separately.

Where a direct connection is made to an existing pipe, the rate covers all labour involved in opening the existing pipe, the removal of the existing end cap and disconnection at the pipe.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSM ROADS (GENERAL) (SANS 1200 M)****PSM3 MATERIAL****PSM 3.2 Responsibility for location**

Add the following to M3.2:

The sub base and base layers of all roads shall be constructed with material from designated borrow areas. The Contractor is responsible for the selection of the material in the borrow areas and if the material in the paving layers do not comply with the minimum requirements it shall be removed and replaced with suitable material at the expense of the Contractor.

PSM 5 CONSTRUCTION**PSM 5.1 Selection**

The Contractor shall deal selectively with material in order that suitable material is not contaminated with unsuitable material. If suitable material is contaminated, the Contractor shall replace such contaminated material with suitable material, at his own expense.

PSM 6 TOLERANCES**PSM 6.3 Frequency of checks**

Add the following to M 6.3:

These checks shall be submitted to the Engineer for his approval.

PSM 7 TESTING**PSM 7.3 Routine inspection and testing**

Substitute M 7.3.3 with the following:

Statistical evaluation of test results shall not be applicable to this contract and all tests shall meet the specified minimum requirements for the specific material.

PSM 8 MEASUREMENT AND PAYMENT

Add the following to M 8.1:

The cost of all routine testing done by the Engineer, and of which the results do not comply with specified minimum requirements for the material, shall be borne by the Contractor.

These costs shall be deducted from the Contractor's monthly payment certificates.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSMJ SEGMENTED PAVING (SANS 1200 MJ)****PSMJ 3 MATERIAL****PSMJ 3.1 UNITS****PSMJ 3.1.2 Class, strength, and type**

Add the following to MJ 3.1.2:

All paved parking areas shall be constructed of 60 mm thick Type S-A class 25 precast concrete blocks (interlocking type). Footpaths shall consist of 60 mm thick Type S-C class 25 precast rectangular concrete blocks. A "Terracotta" colour shall be used.

PSMJ 5 CONSTRUCTION**PSMJ 5.1 Preparation****PSMJ 5.1.2.3 Stabilised subbase**

Add the following to MJ 5.1.2.3:

The subbase for the parking area shall be stabilised.

PSMJ 5.7 Joint filling

Joint filling shall be done with a 1:3 cement-sand mix.

PSMJ 6 TOLERANCES**PSMJ 6.2 Permissible deviations**

Add the following to MJ 6.2:

The degree of accuracy shall be degree I.

PSMJ 8 MEASUREMENT AND PAYMENT**PSMJ 8.2 Scheduled items****PSMJ 8.2.2 Construction of paving complete****Unit: m²**

Add the following to MJ 8.2.2:

The rate shall also cover the cost of the cement-sand mix as specified in PS MJ 5.7.

PSMJ 8.2.6 Placement of pavers instead of painted lines**Unit: m**

If required by the Engineer, parking bays and other painted markings on the parking area shall be indicated with tan-coloured paving blocks.

The rate shall cover the cost of all material, labour and equipment for the placing of such blocks.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSMK KERBING AND CHANNELLING****PSMK1 MATERIALS****PSMK1.1 Concrete**

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 5 CONSTRUCTION**PSMK 5.1 Excavation and bedding**

DELETE THE FIRST PARAGRAPH AND REPLACE WITH:

"Kerbing and channelling shall be constructed on the completed road subbase layers."

PSMK 5.4 Cast-in-situ concrete kerbing and channelling

DELETE THE SECOND SENTENCE OF THE FIRST PARAGRAPH OF SUBCLAUSE 5.4 AND REPLACE WITH:

"The lengths of sections of kerbing between joints shall be uniform throughout and shall not exceed 2 m except where shorter sections are necessary for closures or where otherwise shown on the drawings or required by the Engineer. In the case of cast-in-situ channelling constructed against precast kerbing, the joints in the channelling shall be constructed opposite the centre of every second length of precast kerbing. Joints shall be cut immediately after placing of the concrete."

PSMK 5.8 Machine placed (extruded) kerbing and channelling**PSMK 5.8.3 Subbase Preparation**

DELETE THE WORDS "500 mm beyond as relevant" IN THE FIRST PARAGRAPH OF THIS SUBCLAUSE AND REPLACE WITH:

"150 mm beyond the back face of the kerb or edging strip."

PSMK 5.11 Transition sections and inlet and outlet structures

IN THE LAST LINE DELETE "and with the requirements of the project specification."

ADD NEW SUBCLAUSE:

“PSMK 5.13 Sequence of construction

Before construction of the segmented paving is commenced, the Contractor shall ensure that the kerbing has been completed, complies with the requirements of the Specifications covering kerbing and has been approved by the Engineer.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSMK8 TESTING****PSMK7.1.2 Alternative tests (Sub-Clause 7.2.2)****"PSMK 7.2.2 Tests**

The Contractor shall carry out a minimum of three cube crushing tests per 1 000 m of kerbing placed. The cost of such tests shall be deemed included in the rates tendered for kerbing.

One cube crushing test shall consist of a set of six cubes made with concrete taken from the mixer, the kerbing machine or from any part of the work as ordered.

If, after 28 days in an approved laboratory, after three cubes of any set of six cubes have been tested, the average crushing strength is found to be more than 3 MPa below 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 this section and tested for the estimated actual crushing strength in accordance with SANS method 865 (excluding Appendix A). The cost of drilling and testing the cores is for the Contractor's account, regardless of 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 8 MEASUREMENT AND PAYMENT**PSMK 8.2 Scheduled items****PSMK 8.2.1 Concrete Kerbing**

DELETE SUBCLAUSE 8.2.1(b) AND REPLACE WITH:

"(b) The unit rate for precast kerbing shall cover the cost of supply of all materials for the kerbing, bedding and backing, and for all labour for bedding, jointing, backing, excavating, compacting, testing in terms of Subclause 7.2, together with all backfilling, compacting and removing of excess material.

"PSMK 8.2.14 Removal of Existing Kerbing:

"(a) Removal of existing kerbing and disposing of Unit: m

(b) Removal of existing kerbing and setting aside for re-use
on the Site.....Unit: m

The tendered rates shall include full compensation for providing all labour and equipment, excavations, lifting the kerbs and, in the case of subitem (a), loading and transporting the kerbs from the Site and, in the case of subitem (b), cleaning the kerbs, and temporarily storing them and relaying them elsewhere on the Site."

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSCE CLEANING EQUIPMENT**

The following cleaning equipment is required to perform the cleaning operations as per the requirements of the Phumelela Local Municipality.

- a) One hydro jets delivering 100 litres per minute at 250 bar pressure.
- b) Venture pump for hydro jets.
- c) Power rodder with steel rods mounted on a trailer.
- d) Mini hydro jet delivering 20 litres per minute at 25 bar pressure.
- e) A water bowser with a minimum capacity of 2500 litres
- f) A 1000 litre tanker with a sewer pump attached.

PSCE 1.1 MEASUREMENT AND PAYMENT – CLEANING EQUIPMENT

- a) Fixed Cost.....Sum

The tender lump sum under item a) shall be in full compensation for providing the equipment, the complete service or installation and the use thereof.

- b) Time related.....Month

The tendered rate per month for sub item PSCE (b) represents full compensation for that part of the contractor's obligations which are mainly a function of construction time. The tendered rate will be paid monthly, pro rate for parts of a months, from the date on which the contractor has received the letter of acceptance in terms of clause 5.3.1 of the General; Conditions of Contract, until the end of the period of completion of the works, plus any extension thereof as provided in clause 5.12 of the General Conditions of Contract.

PSCE 1.2 MEASUREMENT AND PAYMENT – EMERGENCY CLEANING

- a) Using High Pressure Jetting..... hour

The tendered rate per hour shall make provision for the separate times of work as indicated in the schedule. The rate shall include the utilization of high pressure jetting equipment to clear, unblock and remove sand, silt, sludge, roots and other foreign objects from sewer pipe lines and manholes within the MMM area. Remove and deposit this material at the official municipal disposal sites.

Response to be within 1 hour of notification and a minimum call out time of 2 hours.

- b) Using Drain Rods and Hand Equipment.....hour

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



The tendered rate per hour shall make provision for the separate times of work as indicated in the schedule. The rate shall include the utilization of drain rods and hand equipment to clear, unblock and remove sand, silt, sludge, roots and other foreign objects from sewer pipe lines and manholes within the MMM area. Remove and deposit this material at the official municipal disposal sites.

Response to be within 1 hour of notification and a minimum call out time of 2 hours.

PSCE 1.3 MEASUREMENT AND PAYMENT – NETWORK REFURBISHMENT - PIPEWORK

a) Using High Pressure Jetting.....m

The tendered rate per m shall make provision for varies pipe diameters as indicated in the schedule. The rate shall include the utilization of high-pressure jetting equipment to clear, unblock and remove sand, silt, sludge, roots and other foreign objects from sewer pipe lines and manholes within the MMM area. Remove and deposit this material at the official municipal disposal sites.

b) Using Drain Rods and Hand Equipment.....m

The tendered rate per m shall make provision for varies pipe diameters as indicated in the schedule. The rate shall include the utilization of high-pressure jetting equipment to clear, unblock and remove sand, silt, sludge, roots and other foreign objects from sewer pipe lines and manholes within the MMM area. Remove and deposit this material at the official municipal disposal sites.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PSCI CAMERA INSPECTIONS**

The following equipment and personnel is required for the proper functioning of inspections for existing sewer systems.

- a) Assistance in operating iPek Push rod camera for sewer lines between 100 mm and 300mm.
- b) The vehicle assisting in inspections must also be equipped with a ladder as well as warning signs and sufficient cones for erection while working in restricted areas.

PSCI 1.1 MEASUREMENT AND PAYMENT – CAMERA INSPECTIONS

- a) Camera inspection.....m

The tender rate shall include the setting up of equipment at manholes, assisting the Employer's Agent in pushing the camera into the pipes and cleaning equipment afterwards for the varies diameters of pipe as indicated.

- b) Blocking flow in manholes.....No

The tender rate shall include the blocking of manholes with plug stoppers to assist the Employer's Agent in camera inspections for the varies diameters of pipe as indicated.

- c) Diversion of Flow.....hr

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB BUILDING WORK SPECIFICATION****PB 1 SCOPE**

This section specifies the general requirements for the construction of buildings.

PB 2 INTERPRETATIONS**PB 2.1 Supporting specifications**

- (a) Project Specification;
- (b) SANS 1200 A or SANS 1200 AA as applicable;
- (c) SANS 1200 C;
- (d) SANS 1200 D or SANS 1200 DA as applicable;
- (e) SANS 1200 G or SANS 1200 GA or SANS 1200 GB as applicable.

PB 2.2 General

Building work shall be carried out in accordance with the National Building Regulations and Building Standards Act, 1977, and these specifications.

References to specifications and codes of practice of the South African Bureau of Standards shall be taken to be references to the latest edition of such specifications and codes of practice as amended. Where possible the SANS mark shall appear on all articles, materials or items where it is required to comply with such SANS specification.

PB 2.3 Commercial products

In all instances where the Contractor handles, stores, uses, applies or fixes commercial products, the work shall be strictly carried out according to the instructions of the manufacturer of such products.

PB 2.4 Samples

The Contractor shall furnish without delay, such samples as called for or may be called for by the Engineer. Materials or workmanship not corresponding with approved samples, may be rejected by the Engineer and shall be removed from the works at the cost of the Contractor.

PB 3 MATERIALS**PB 3.1 Cement**

Cement for masonry work comply with the requirements of SANS EN 431-1 and cement for concrete work shall be CEM I Portland cement or CEM III blast-furnace cement complying with the requirements of SANS EN 197-1.

Separate storage facilities shall be provided for the various types of cement.

PB 3.2 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 mortar, plaster or floor screed.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB 3.3 Lime**

Lime shall be hydrated bedding mortar lime complying with the requirements of SANS 523.

PB 3.4 Aggregate

Sand for plaster and mortar shall comply with the requirements of SANS 1090, whereas the aggregates for normal and granolithic floor creeds shall comply with the requirements of BS1199 and BS1201 respectively.

PB 3.5 Burnt clay bricks

Burnt clay bricks shall comply with the requirements of SANS 227 and shall also be equal in all respects to the three samples of each type of brick furnished by the Contractor prior to commencement of the works and as approved by the Engineer.

General purpose (special) bricks shall be used in foundation walls and lintels.

The colour and texture of face bricks shall be as specified in the project specifications. Care shall be taken to avoid damage to arise and faces during transport and handling.

Fire bricks shall be of well burnt refractory fire clay, resistant to spalling and cracking and of same size as the ordinary bricks.

PB 3.6 Concrete masonry units

Pre-cast concrete masonry units shall comply with the requirements of SANS 1215 and shall be solid unless specified otherwise in the project specifications.

PB 3.7 Calcium silicate masonry units

Calcium silicate masonry units shall comply with the requirements of SANS 285.

PB 3.8 Wall ties

Wall ties shall comply with the requirements of SANS 28.

PB 3.9 Air bricks

Air bricks shall be well-burnt terra-cotta air bricks in external faces of walls and 250 mm x 150 mm rectangular gypsum air bricks covered with copper mosquito gauze in internal faces.

PB 3.10 Brick reinforcement

Brick reinforcement shall be hard drawn mild steel comprising two 3,15 mm diameter wires spaced 75 mm apart and 2,8 mm diameter cross wires spaced at not exceeding 300 mm apart welded to main wires.

PB 3.11 Quarry tiles

Quarry tiles shall be of approved quality, even in thickness, truly square, free from cracks, twists and blemishes and uniform in colour and unless otherwise specified, shall be of approved red colour.

PB 3.12 Ceramic tiles

Glazed ceramic tiles for walls shall comply with the requirements of SANS 22 and, unless otherwise specified, shall be white, size 150 mm x 150 mm x 6,5 mm thick.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Ceramic tiles for floors shall comply with the requirements of SANS 1449 and, unless otherwise specified, shall be unglazed, size 240 mm x 115 mm x 20 mm thick and of approved colour.

PB 3.13 Concrete paving slabs

Concrete paving slabs shall be precast units of grade 25 MPa/13 mm concrete and shall be of approved manufacture, at least 50 mm thick and sizes 250 mm x 250 mm minimum and 600 mm x 600 mm maximum.

Concrete slabs shall be even in thickness, truly square, free from cracks, twists and blemishes, with a uniform natural cement colour and surface finished smoothly in the mould and shall also be equal in all respects to the samples furnished by the Contractor prior to commencement of the works and as approved by the Engineer.

PB 3.14 Damp-proof membrane

Damp-proof membrane under floors, unless otherwise specified, shall be of polyethylene sheeting complying with the requirements of SANS 952 as Type C-plain surfaces specified therein, 250 microns in dry areas and 375 microns in wet areas.

PB 3.15 Damp-proof course in walls

Horizontal and vertical damp-proof course, unless otherwise specified, shall be of bituminous sheeting complying with the requirements of SANS 248 and as Type FV (Fibre Base) sheeting or as Type GH (Hessian Base) sheeting specified therein, or of polyethylene sheeting complying with the requirements of SANS 952 and as Type A-plain surfaces 450 microns or as Type B-embossed surfaces 375 microns as described therein.

PB 3.16 Treatment of timber

All timber shall be given a preservative treatment suitable for the duty for which the timber is intended in accordance with SANS code of practice 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.

PB 3.17 Structural timber

Structural timber, unless otherwise specified, shall be of South African softwood (pine) complying with the requirements of SANS 563 or SANS 1245 and, unless otherwise specified or shown on the drawings, shall be of Grade 4 and shall be marked as laid down in the specification.

Roof battens and other structural timbers not less than 50 mm or more than 65 mm in width and not less than 38 mm or more than 50 mm thickness, shall be of South African softwood (pine) complying with the requirements of SANS 653.

All structural timber shall bear the full standardisation mark of the South African Bureau of Standards.

The tolerance by which "actual" dimensions may vary from the "nominal" dimensions specified or stated on drawings of South African sawn structural softwood, shall be as laid down in SANS 563, SANS 653 and SANS 1245 where relevant.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB 3.18 Structural laminated timber****(a) Stock glued laminated timber of S.A. pine**

Stock glued laminated timber of S.A. pine shall comply with the requirements of SANS 1089 and shall be marked as laid down in the specification and shall also bear the standardisation mark of the SANS.

(b) Designed glued laminated timber

Structural glued laminated timber shall comply with the requirements of SANS 876 and shall be marked as laid down in the specification and shall also bear the standardisation mark of the SANS.

The timber shall be of -

- (i) softwood or hardwood;
- (ii) the density group and grade;
- (iii) the exposure category;
- (iv) moisture content; and
- (v) of Class A or Class B appearance;

as specified and, in services having timbers treated against infestation by insect pests, shall be treated against pests as laid down in the specification for laminated timber.

PB 3.19 Galvanised steel roofing sheets

Galvanised steel roofing sheets shall be of the profile as scheduled or shown on the drawings, of 0,60 mm thick mild steel (before galvanising) and shall be galvanised on both sides to the requirements of SANS 934 for a Class Z250 coating, unless a Class Z600 coating is specified, and shall be passivated.

PB 3.20 Metal ridging for steel covered roofs

Galvanised iron ridging for ridges and hips of steel covered roofs shall be of 0,60 mm thick flat mild steel (before galvanising), galvanised as specified for roofing sheets in clause 3.19.

PB 3.21 Fibre cement roofing sheets

Fibre cement roofing sheets shall be of the profile scheduled or shown on the drawings and shall comply with the requirements of SANS 685. The sheets shall be not less than 6 mm thick.

PB 3.22 Adjustable fibre cement ridging

Adjustable fibre cement ridging for ridges of fibre cement covered roofs, shall be of same manufacture as the roofing sheets, of not less than 6 mm thick material, with overlapping end joints and shall suit the profile of the roofing sheets. Width of wing shall be not less than 300 mm measured from the centre of roll.

PB 3.23 Fascias and barge boards

Fascias and barge boards shall be, unless otherwise specified, of pressed fibre cement boards of section described in long lengths.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB 3.24 Fibre cement flashings**

Fibre cement flashing for horizontal top edges of roofs butting against vertical wall or other surfaces, shall be of same manufacture as the roofing sheets of not less than 6 mm thick material and with overlapping end joints. The flashings shall suit the profile of the roofing sheets and shall extend not less than 300 mm onto the roof sheeting, shall have plain upstands against the vertical surfaces and shall be flashed over with metal as described.

PB 3.25 Fibre cement gutters

Fibre cement gutters shall be of approved manufacture, of not less than 6 mm thick material and with spigot and socket ends.

Gutter brackets shall be heavy quality galvanised steel or non-ferrous metal brackets as supplied by the manufacturers of the gutters.

PB 3.26 Fibre cement rainwater down pipes

Fibre cement rainwater downpipes shall be of approved manufacture, with spigot and socket ends. The material in circular rainwater downpipes 75 mm diameter shall be not less than 6 mm thick, and in circular pipes over 75 mm diameter and in all sizes of square and rectangular pipes, shall be not less than 8 mm thick.

Holderbats for rainwater downpipes shall be heavy quality galvanised steel or non-ferrous metal holderbats.

PB 3.27 Concrete roofing tiles

Concrete roofing tiles shall comply with the requirements of SANS 542, except that the concrete in the body of the tile need not be coloured where tiles have natural stone granular finish, and shall be of pattern and colour specified.

Unless otherwise specified, the tiles shall have natural stone granular finish.

PB 3.28 Covering to ceilings**(a) Gypsum plasterboard ceilings with plaster finish**

Gypsum plasterboard for ceilings shall be 6,4 mm thick gypsum ceiling board, complying with the requirements of SANS 266.

The cover strips shall be galvanised or lacquered wire gauze not less than 60 mm wide. The plaster shall be a retarded semi-hydrate wood-fibre plasterboard bonding gypsum plaster.

(b) Fibre cellulose board ceilings

Fibre cellulose board for ceilings shall comply with the requirements of SANS 803 and, unless otherwise specified, shall be 6 mm thick and of flat (unpressed) type.

PB 3.29 Cove cornices to ceilings**(a) Gypsum plasterboard cornices**

Cove gypsum plasterboard cornices to ceilings shall comply with the requirements of SANS 622 and shall be of 82 mm or 120 mm girth as specified.

(b) Timber cornices

Timber cornices to ceilings shall be 32 mm hardwood Scotia's.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB 3.30 Flat fibre cement sheets**

Flat fibre cement sheets other than fibre cellulose boards described in sub clause 3.28(b), shall comply with the requirements of SANS 685.

PB 3.31 Timber for joinery

Softwood for joinery shall comply with the requirements of SANS 1359 and hardwood with the requirements of SANS 1099.

Timber for joinery shall be of clear grade, unless otherwise specified. Counter tops and other tops, where only one face side is visible, shall be of semi-clear grade timber.

PB 3.32 Framed and ledged batten doors**(a) Softwood doors**

To be 44 mm thick framed and ledged batten doors complying with the requirements of SANS 545, but the timber shall comply with the requirements of SANS 1359 and shall be of clear grade.

(b) Hardwood doors

To be 44 mm thick framed and ledged batten doors complying with the requirements of SANS 545, but the timber shall comply with the requirements of SANS 1099 and shall be of clear grade. The hardwood shall be solid without any laminations.

PB 3.33 Flush doors

Flush doors shall be solid laminated, chip core or hollow-core as specified and shall comply with the requirements of SANS 545. All glue used in the manufacture of the doors shall comply with the requirements of the above specification.

Unless otherwise specified, face veneers shall be rotary cut, and shall be of timber specified or where doors are to be painted shall be of timber suitable for painting.

Edge-strips to conceal the vertical edges of doors shall be not less than 10 mm thick and of the same timber as face veneers; edge strips to meeting edges of doors in two leaves where edges are to be rebated, shall be not less than 20 mm thick.

Faces of doors shall be machine-sanded to a smooth and even surface.

All glueing together of core strips and glueing on of veneers, edge-strips, etc. shall be done under hydraulic pressure.

The top and bottom edges of doors showing end grain, shall be sealed with lacquer, or other suitable material, before leaving the manufacturer's works, and similarly sealed after doors are fitted into frames if the edges of doors are disturbed during fitting.

PB 3.34 Ironmongery

All ironmongery shall be of best quality and shall be approved by the Engineer, before fixing.

Screws for fixing of articles shall be of similar metal than the articles.

Locks shall comply with the requirements of SANS 4 and shall be supplied with two keys each.

Unless otherwise specified, interior and exterior doors shall be fitted with two and four lever heavy-duty mortice locks respectively, which shall be master-keyed.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



No key shall pass a second lock. On no account shall the keys be delivered with the doors or locks to the building site. Failure to observe these instructions may entail the provision of new locks and keys.

PB 3.35 Hot-dip galvanising to steelwork

Where prescribed, all steelwork built in as the work proceeds, shall be hot-dip galvanised after fabrication and before leaving the manufacturer's works, in accordance with SANS 763.

Where they occur, site welds shall be zinc sprayed in order that the zinc coating be even and continuous over all surfaces.

PB 3.36 Pressed steel door frames

Pressed steel door frames shall comply with the requirements of SANS 1129 and shall be constructed of 1,6 mm thick mild steel sheeting, pressed or rolled to the required shapes, properly mitred, welded and reinforced.

Frames shall be of widths required to suit the thickness of walls into which they are built and shall be fitted with suitable tie-bars and braces at bottom, and lugs for building in, three to each jamb of frames without fanlights and four to each jamb of frames with fanlights.

Where fanlights are shown over doors, the frames shall be fitted with transoms of pressed or rolled steel sheet as above and rebate for fanlights and for doors if required.

The rebates in frames and transoms for doors and fanlights shall be of width required to suit the thickness of doors and fanlights.

Frames shall each be fitted in the rebate of one jamb with a pair of approved 100 mm steel butt hinges, and transom to opening fanlights hung at bottom shall each be fitted with a pair of approved 75 mm steel butt hinges, all set flush into recesses in frames and either fixed with countersunk screws or securely welded on.

Frames shall be holed as and where required for screws fixing fanlight openers, keeps of spring catches, etc. Where fanlights are shown to be fixed into frames, the frames shall be holed in the rebates, for screws, securing the fanlights, four to each frame.

Frames shall each be fitted in one jamb, with approved chromium plated or stainless steel (unless otherwise specified) adjustable striking plate keep, boxed in at back of frame with sheet metal box welded on, and not less than two rubber buffers.

All welding shall be cleaned off smooth and flush on exposed faces and frames shall be cleaned and primed as described for steel windows before leaving the manufacturer's works.

PB 3.37 Steel doors, sidelights and fanlights

Steel doors, sidelights and fanlights shall, in the case of stock types, comply with the requirements of SANS 727, and in the case of purpose made types with the constructional and other requirements of the above specification wherever applicable, and shall in addition be equipped with the following:

- (a) Suitable weather bars where required to render doors, etc., perfectly watertight;
- (b) Suitable lugs, or holes at the same spacing as the standard fixing lugs, for screwing frames to plugs in the concrete, where frames of doors, etc. are to be fixed to concrete columns, beams, etc.,
- (c) A primer as described for steel windows, except where hot-dip galvanising is prescribed.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Doors, sidelights and fanlights, unless otherwise shown shall be of "one piece" construction, but where shown to be in two or more "one piece" units, the units shall be coupled together with standard coupling-mullions and/or transoms.

Bottom openings in doors and sidelights shall be fitted with kicking plates of one thickness of 1,6 mm thick mild steel sheet fixed with metal beads.

Frames of outward opening doors shall be fitted at bottom with sills of door framing section (stepped sills) and of inward opening doors with metal ties, welded to frames, for embedding in thresholds (flush sills).

Stock doors, sidelights and fanlights shall be of the types shown on drawings and purpose made doors, sidelights and fanlights shall be constructed to the forms and sizes shown on drawings.

Unless otherwise specified, the doors shall be of not less than 33 mm universal sections and the sidelights and fanlights of standard 25 mm sections.

Fanlights shall be hung and fitted as described for steel windows in clause 3.39.

PB 3.38 **Balance type steel door**

The balance type steel door shall be of the "back track" type tip-up door, constructed of not less than 0,8 mm thick mild steel sheeting, pressed to form troughed or fluted pattern horizontal panels, each approximately 200 mm wide, all strongly reinforced at back with 1,2 mm thick top hat section mild steel braces and/or stiffeners and provided all round exposed edges with 1,2 mm thick mild steel channels, all properly welded together and with all welding cleaned off smooth and flush.

The door is to be hung on two galvanised flexible steel cables of not less than 5 mm diameter, connected at lower ends to 125 mm diameter steel encased counterweights of such length and mass as will balance the door in the full open position and connected at upper ends to door unit by passing cables over 140 mm diameter bushed cast aluminium pulleys, securely fixed to 2,50 mm thick mild steel top plates.

The movement of door is to be controlled by means of sintered metal rollers, (nylon rollers are not acceptable) securely fixed at top and centre of outer edges to door unit to operate in horizontal and vertical runner guides respectively. The guides are to be formed of 37 mm x 32 mm x 25 mm mild steel channels and with vertical channels fitted at upper ends with horizontal channels, welded on to form back track for top rollers. Each vertical channel is to be four times bolted to jamb of door opening and each horizontal channel is to be secured in position to internal wall with mild steel angle bracket, twice bolted to wall to form rigid construction.

The counterweights to door to be encased with 2,50 mm thick mild steel cover plates, each the full height of door and securely fixed to wall and channel guide.

Door to be fitted near bottom with cast aluminium lifting handle for operating the door and with chromium plated locking handle, complete with control rods and with striking plate bolted to lintel, over door opening. The locking handle is to be operated from outside and is to be provided with two keys.

Before leaving the manufacturer's works, all metal is to be given a protective priming coat of paint in accordance with the requirements of SANS 909.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB 3.39 Steel windows**

Stock residential and industrial type steel windows shall comply with the requirements of SANS 727 and all other types both stock and purpose made shall comply with the constructional and other requirements of the above specification wherever applicable, and shall in addition be equipped with the following:

- (a) Suitable weather bars where required to render the windows perfectly watertight;
- (b) Suitable lugs, or holes at the same spacing as the standard fixing lugs, for screwing frames to plugs in the concrete where frames of windows are to be fixed to concrete columns, beams, etc.;
- (c) Windows and components, except where specified to be hot-dip galvanised, shall before leaving the manufacturer's works, be cleaned by acid pickling rinsing and drying, as laid down in SANS code of practice 064, or by other approved means, to remove all scale, rust, grease, oil and foreign matter and then primed with red oxide zinc chromate primer complying with the requirements of SANS 909, applied by dipping or by means of spray gun.

Ventilators hung at side to open out in windows above ground floors and not accessible for cleaning from an adjoining opening ventilator in the same window or from verandas, balconies and the like, shall be hung on projecting hinges.

Windows, unless otherwise specified, shall be of "one piece" construction, but where shown to be in two or more "one piece" units, shall be coupled together with standard coupling mullions and/or transoms.

Windows shall be fitted with solid brass handles, stays, catches and other fittings, those to windows constructed of universal sections having polished finish and to all other windows rumpled finish. The fittings shall be fixed in such a way as to be removable after windows are glazed.

PB 3.40 Resilient floor finishings

Semi-flexible vinyl (vinyl-fibre) floor tiles shall comply with the requirements of SANS 581; flexible vinyl (PVC) floor tiles and sheeting shall comply with the requirements of SANS 786 and thermoplastic (asphaltic) floor tiles shall comply with the requirements of SANS 586. Unless otherwise described, the flooring shall be of marbled pattern and of approved light colour and tiles shall be 230 mm x 230 mm or 250 mm x 250 mm in size.

Vinyl cove skirtings shall be of approved manufacture and colour and unless otherwise stated, 70 mm in height.

PB 3.41 Glass for glazing

Glass for glazing shall comply with the requirements of CKS 55.

Glass not exceeding 0,75 square metre surface area of glass pane, shall be flat drawn clear sheet glass of "QQ" quality (ordinary glazing quality) and of 3 mm thickness.

Glass exceeding 0,75 square metre and up to 1,5 square metres surface area of glass pane, shall be clear float glass of "GG" quality (glazing quality) and of 4 mm thickness.

Laminated safety glass for glazing shall be of "SQ" quality (selected glazing quality) and of 6 mm thickness unless otherwise specified. If high impact strength glass is used, whether cut to size or not, the stencil mark is to appear in a prominent place on the glass.

Toughened safety glass for glazing up to 3 square metres shall be, unless otherwise specified, of 4 mm thickness and must be ordered to the correct size as toughened glass

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



cannot be cut, and each piece of glass to be marked in a clear and permanent fashion. (For bigger sizes, manufacturer's instructions are to be followed).

Any pane of glass installed in any door shall, where not made of safety glass, be not more than 1 m² in area and shall have a nominal thickness of not less than 6 mm.

Obscure glass for glazing, unless otherwise specified, shall be Arctic or other similar approved figured rolled glass, of a nominal thickness of not less than 3 mm for glass panes up to a surface area of 0,75 square metre and not less than 5 mm over 0,75 square metre.

Putty for glazing shall comply with the requirements of SANS 680, of Type I for glazing in wood and of Type II for glazing in steel windows, doors, etc. Putty used for glazing in unpainted hardwoods, shall be tinted to match the colour of the wood.

PB 3.42 **Paints**

All materials for paint work for which South African Bureau of Standards specifications have been published, shall comply with the requirements of such specifications and shall bear the standardisation mark of the South African Bureau of Standards on the container or packing. Materials for paint work for which no SANS specifications have been published shall be of brand and manufacture approved by the Engineer.

All materials for paint work must be brought on to the site in unopened containers and no adulteration will be allowed.

Undercoats for paint work shall be as supplied by the manufacturer of the paint being used for the finishing coat.

Paints shall be suitable for application on the surfaces on which they are to be applied, and those used externally shall be of exterior quality or suitable for exterior use.

If necessary, paints shall be strained free from skins and similar impurities immediately before application.

The various primers, undercoats, paints and distempers shall comply with the requirements of the specifications quoted hereunder and shall be of the type of grade stated, viz:

(a) **Primers**

(i) For wood:

SANS 678. Type I shall be used on exterior woodwork and Type III on interior woodwork.

(ii) For metal:

Dip or spray application (red oxide zinc chromate). For steel windows, doors, door jambs, and other articles normally dip or spray primed in the manufacturer's works: SANS 909.

Brush application (zinc chromate). For all metal surfaces primed on site and then painted: SANS 679, Type I.

(iii) For structural steel (red lead)

SANS 312, Type II, Grade.

(iv) For galvanised iron

SANS 912.

(v) For galvanised metal surfaces and surfaces of non-ferrous metals

Wash primer (metal etch primer) : SANS 723.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**(b) Undercoats**

For all surfaces under HIGH GLOSS, OIL GLOSS, FLAT and EGGSHELL finishing paints: SANS 681, Type II.

(c) Paints

(i)	High gloss	:	SANS 630
(ii)	Oil gloss	:	SANS 631
(iii)	Flat and eggshell	:	SANS 515
(iv)	Emulsion paint (interior)	:	SANS 633, Grade I
(v)	Emulsion paint (exterior)	:	SANS 634, Synthetic Polymer Base Type, but pure acrylic resin base for fibre cement surfaces
(vi)	Aluminium paint	:	SANS 682, Grade II
(vii)	Roof paint	:	SANS 683, Type B
(viii)	Structural steel paint	:	SANS 684, Type B
(ix)	Epoxy tar	:	SANS 801 (types as specified)

(d) Distemper

SANS 322

(e) Varnish for interior use

SANS 887, Type I with eggshell finish.

PB 4 PLANT**PB 4.1 General**

The Contractor shall have at his disposal the normal plant necessary for the proper and neat completion and rounding off of all facets of the building work.

PB 5 CONSTRUCTION**PB 5.1 Bricklayer****PB 5.1.1 Cement Mortar**

Cement mortar shall, unless otherwise specified, be composed of four parts by volume of sand and one part by volume of cement for normal brickwork, and three parts by volume of sand and one part by volume of cement 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.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Care shall be taken in mixing cement mortar to remove from the mixing machine or platform any old mortar that has already set, as such mortar must not be incorporated in any new batch.

Cement mortar shall be produced in such quantities as can be used before commencing to set, as no cement mortar that has once commenced to set shall be used in any way.

PB 5.1.2 **Brickwork**

Brickwork, wherever practicable and not otherwise specified, shall be built in English bond. No false headers shall be used, and none but whole bricks employed, except where legitimately required to form bond.

The brickwork, unless otherwise specified, shall be built in 4:1 cement mortar. Brick arches and brick lintels shall be built in 3:1 cement mortar.

The bricks shall be laid on a solid bed of mortar and all joints thoroughly grouted up solid throughout the whole width of each course.

The brickwork shall be carried up in a uniform manner, no portion being raised more than 1,2 m above an adjacent portion.

The bricks shall be well saturated with water, in the stack or dump, approximately two hours before being used. The tops of walls left off, shall be well wetted before work is recommenced.

All rough and fair cutting and cutting of splays, skew backs, chamfers, etc., shall be properly performed.

All necessary openings for pipes, etc., shall be formed or left and made good after pipes, etc., are fixed in position.

Walls generally shall be taken up two courses above panelled ceilings in the same mortar as the wall below and cut between ties, etc.

Where hollow concrete masonry units are used brick-force shall be built into the walls every third course. Mortar for hollow concrete masonry units shall consist of one part cement, two parts lime and nine parts sand by volume. All cavities below floor level shall be filled with Grade 15 MPa/19 mm concrete.

PB 5.1.3 **Mortar Joints**

Mortar joints to brickwork generally shall be 10 mm in thickness.

The joints in brickwork receiving plaster, tiling or similar finishing's, shall be raked out whilst the mortar is soft to form key for the plaster or mortar backing. The depth of the raking out will depend on the condition of the bricks; the rougher the bricks on face the shallower the raking out and the smoother the bricks the deeper the raking out.

The joints in brickwork shall be flushed off where walls are to be bagged, in readiness for the bagging.

PB 5.1.4 **Brickwork In Thicknesses**

Walls built in two or three thicknesses shall be tied together with and including metal ties of sufficient length to allow not less than 75 mm of each end to be built into brickwork and shall be spaced not more than 1 m apart to every third course and staggered.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB 5.1.5 Brickwork In Linings**

Linings to concrete shall be tied with and including 4 mm diameter galvanised crimped wire ties of necessary length to allow 75 mm to be bedded into concrete and 75 mm of the other end to be built into brickwork and evenly spaced 1 m apart to every third course and staggered.

PB 5.1.6 Half Brick Thick Walls

Half brick thick walls shall be built in 4:1 cement mortar and reinforced with 75 mm wide brick reinforcement, one row to every eighth course in height, and built 100 mm into main connecting walls. The reinforcement shall be lapped 150 mm at end joints, where these are necessary, and 75 mm at angles.

PB 5.1.7 Cavity Walls

Cavity walls, unless otherwise specified, shall be built with two half brick thicknesses of brickwork in stretcher bond with 50 mm cavity between, and the two thicknesses tied together with 200 mm long metal wall ties of the butterfly type, spaced at not more than 1 m centres alternately to every third course of brickwork.

Unless otherwise specified, the brickwork shall be built in 4:1 cement mortar.

The cavities shall be carried up from one course of brickwork below damp course level up to two courses below wall plate level, unless otherwise shown or specified. The brickwork above cavities shall be built solid, and where 270 mm thick shall be cut and well bonded where possible. Cavities in foundation walls of cavity walls shall be filled with Grade 15 MPa/19 mm up to 150 mm below the damp-proof course level.

The cavities shall be kept free of all rubbish, mortar droppings and projecting mortar.

The tops of walls shall be covered with planks or sacking during wet weather to prevent rain from entering the cavities.

The cavities shall not be ventilated.

At door, windows and other openings, the cavities shall be stopped 110 mm back from jambs of openings with the inner thickness of brickwork returned and stopped against the outer thickness and not bonded to same. A 110 mm wide strip of damp-proof sheeting as described for damp-proof course in clause 3.15 shall be built in between the two thicknesses in the joint formed by the return and the outer thickness. The damp-proof strip shall be lapped at least 50 mm on to the sheeting between the two thicknesses of sills and between the two thicknesses of lintels.

Sills to windows shall be divided into external and internal thicknesses with strips of damp-proof sheeting as above, built in line with the damp-proof sheeting in jambs and extending 100 mm beyond the jambs of openings.

The lintels shall be provided with damp-proof sheeting as described under lintels.

Unless otherwise specified, cavities shall be stopped one course below and one course above and 110 mm from sides of openings for air bricks and the like.

PB 5.1.8 Reinforced Brick Lintels

Reinforced brick lintels shall be built with sound machine made bricks, in 3:1 cement mortar, with all vertical and horizontal joints filled solid with mortar throughout the required number of courses and to a distance of at least 330 mm on either side of the clear opening.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



The number of courses in lintels over the various size openings shall be as specified in table hereunder, and reinforcing steel wires or rods shall be built into the first horizontal joint over the bottom course as laid down therein, viz.:

LINTEL SPAN	NUMBER OF COURSES	REINFORCEMENT
Not exceeding 1 m	4	One row of 75 mm wide brick reinforcement for each half brick width soffit.
Over 1 m to 1,5 m	6	One row of 75 mm wide brick reinforcement for each half brick width soffit.
Over 1,5 m to 2,1 m	7	Three 6,3 mm diameter mild steel rods for each half brick width of soffit.

The reinforcing wires and rods shall be of length at least equal to the width of the clear opening plus 330 mm at each end. The reinforcement shall be evenly spaced in the brick joints, with the outer wires or rods having at least 20 mm cover from face of brickwork.

Brick lintels in 270 mm thick cavity walls shall be built in two half brick thicknesses in stretcher bond, with inner face of outer thickness for a depth of three courses above soffit, covered with sheeting as for damp-proof course, the full length of lintels, and space between the two thicknesses for the depth of the sheeting filled in solid with Grade 15 MPa/19 mm concrete. Where cavities continue above lintels, the sheeting shall be taken up and turned on to top of first course of brickwork to inner thickness of wall, above the concrete filling in lintels.

The lintels, except where built over pressed steel door frames and the like, shall be supported on temporary formwork left in position for at least fourteen (14) days.

PB 5.1.9 Pre-cast concrete Lintels

Pre-cast concrete lintels shall be built in overall openings. The lintels shall be the full width of the wall and shall have its ends neatly cut with a cutting disc. Building-in and propping shall be specified by the supplier and brick force- extending at least 350mm to the outside of the opening – shall be built into each of the first five mortar beds above the opening.

PB 5.1.10 Beam Filling

Beam filling, unless otherwise specified, shall be half brick thick, built in similar mortar as used in the walls below, cut in between roof timbers and carried hard up to underside of roof covering, and flushed up in mortar.

PB 5.1.11 Bagged Finish to Brickwork

Bagged finish to brickwork, if done whilst the mortar in joints is still soft, shall be formed by rubbing over the wall surfaces with wet rough sacking, until all joints and crevices are filled up and an even surface is obtained. Mortar, as used for building the brickwork, shall be added as may be necessary.

If bagging to walls is done after the mortar in joints has set the wall surfaces shall be rubbed over with wet rough sacking as above, but cement grout shall be added as necessary to fill up the joints and crevices and to obtain an even surface.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB 5.1.12 Building In brick Work**

Ends of timbers, hold-fasts, cramps, gratings, air bricks, dowels, etc., shall be built-in in cement mortar.

Door and window frames and the like shall be set up in positions for building in and securely strutted to prevent distortion whilst the brickwork, lintels, etc., are being built.

Pressed steel door frames shall be grouted in solid at back with cement mortar as the work proceeds.

Wood slips, fixing bricks, hoop iron, roof ties, etc., shall be built in as the work proceeds.

Ventilators shall be built into openings formed in the walls, in 3:1 cement mortar, and grouted in solid with similar mortar and wall finishes made good if disturbed.

Wood frames to doors, windows, etc., shall be set up in position for building in as described and built in as the work proceeds with cramps to jambs of 1,6 mm thick galvanised hoop iron, 32 mm wide, with ends turned 50 mm up against stiles of frames and each twice screwed to frame, and built 450 mm into wall with end turned up into brickwork joint. Cramps shall be built in approximately 0,3 m up from bottom and approximately 0,3 m down from head of frames and intermediately at not exceeding 0,85 m apart. No frame shall have less than two cramps to each jamb irrespective of height.

Cramps to frames in 270 mm thick cavity walls shall be cranked as necessary and built into inner and outer thicknesses of walls alternately.

The stiles of wood door frames, and similar frames not having sills framed in, shall be doweled to concrete, brick, stone and similar thresholds with 10 mm diameter mild steel dowels 75 mm long, one to each stile.

PB 5.1.13 Securing of Roofs

Roof trusses shall be fixed at each support to walls with ties of 1,2 mm thick galvanised hoop iron, 30 mm wide, built 750 mm deep into brickwork or embedded 300 mm deep into concrete or wrapped around bottom layer of reinforcing in a reinforced concrete beam and, unless otherwise specified, wrapped over truss and fixed with four galvanised nails, 60 mm long and taken up to and lapped round the nearest purlin and well spiked thereto.

PB 5.1.14 Bedding and Pointing

All door, window and similar frames shall be bedded and pointed in 3:1 cement mortar. All wall plates shall be set true and level and bedded in 4:1 cement mortar.

Steel door and window frames shall be carefully pointed all round and made perfectly watertight.

Where steel door and window frames are specified to be pointed with mastic compound, they shall be pointed all round externally with an approved waterproof compound, of such composition that it will not stain surrounding surfaces, and that it will adhere tenaciously, remain plastic without sagging or running, be capable of accommodating any normal movement of the joint sealed, and will receive paint without "bleeding". The pointing material shall be forced into the joints, which shall have been previously prepared to receive same, by means of a pressure gun, or by other suitable method, all in accordance with the manufacturer's instructions.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB 5.1.15 Faced Brickwork**

Faced brickwork shall be built fair and the joints shall be square recessed to a depth of approximately 6 mm, formed with a square jointing tool well pressed into the joints as the work proceeds.

The Contractor shall construct a test section of 10 m² which shall be approved by the Engineer, before continuing with faced brickwork.

Face bricks shall be sorted by the brick manufacturer at his yard or by the Contractor on the site, to ensure that proper mixing of the bricks within the colour range of each type of facing brick being used is obtained; sudden changes in the general colour of face work in any one type of facing brick will not be acceptable.

Sand in mortar for all faced brickwork shall all be from one source.

Faced brickwork shall be kept perfectly clean and rubbing down of the brickwork shall not be allowed. Scaffold boards shall be turned back during rain to avoid splashing. Soiled brickwork shall be cleaned at the Contractor's expense, and the cleaning method shall be approved by the Engineer.

PB 5.1.16 Fibre Cement Sills

Sills shall be in single lengths cut between reveals, fitted with fixing lugs and solidly bedded in 3:1 cement mortar with a slight projection beyond the finished wall face below.

Internal sills shall be level. External sills shall be set sloping on cut brickwork or on fine concrete filling under.

PB 5.1.17 Laying of Quarry Tiles

Joints to paving shall be continuous in both directions.

Tiles shall be solidly bedded and jointed in 3:1 cement mortar with joints, unless otherwise specified, 6 mm wide and slightly pointed with a round jointing tool. Tiles shall be well soaked in water before fixing and thoroughly cleaned off after fixing.

Tiles in sills, copings, etc., shall be set with slight projection over finished wall face, and where full tiles do not fit into the length, two cut tiles shall be used, symmetrically placed as directed.

PB 5.1.18 Installation of Electrical Service

The Contractor shall embed in the concrete and/or brickwork, as the work proceeds, all conduits, boxes, etc., which will be fixed in position by the electricians, and must cut all necessary chases and holes in walls for conduits and form recesses in walls for distribution boards, all in the positions directed, notwithstanding whether the installation of the electrical service is carried out by the Contractor or under a separate contract. Alternatively, distribution boards may be built into walls as the work proceeds, providing prior approval is obtained from the Engineer.

The Contractor shall afford every facility and shall render reasonable assistance to the electricians in carrying out their work, and shall make good where necessary, in all trades, after installation has been completed.

PB 5.1.19 Installation of Mechanical Equipment

Where the installation of mechanical equipment is carried out under a separate contract the Contractor shall arrange for the building in of special fittings, leaving holes and openings or forming chases in floors, walls, etc., for pipes, cables etc., and for the building in of pipes, sleeves, pipe clips, bolts, etc., as required or directed.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



All cutting of holes through finished floors, walls, etc., after the concrete or mortar has set, must be avoided as far as possible, and the Contractor must give ample notice to the Engineer who will ascertain the exact positions where pipe sleeves, pipes, pipe clips, etc., are to be built in.

PB 5.1.20 Protect and Clean Down Brickwork, Etc.

Angles of face brickwork, reveals, steps, etc., liable to damage shall be covered up and protected during the progress of the remaining work, and any damage done shall be made good at the Contractor's expense and to the satisfaction of the Engineer.

Face brickwork and brick and tile sills, copings, etc., shall be cleaned down as the work proceeds, and surfaces liable to be soiled by mortar or plaster splashes during the progress of the remaining work shall be covered with paper, pasted on, or by other approved means. At completion of the works the coverings shall be removed and the surfaces again cleaned down to the satisfaction of the Engineer.

Any detergent or other materials used in the cleaning down of face brickwork, etc., shall be of such nature that will not harm adjoining paint and other finishing's in any way.

All tile and other pavings shall be thoroughly cleaned off after laying to remove all traces of mortar and other substances, covered up and protected from damage during the progress of the works, and again cleaned off at completion.

PB 5.2 Tiler

PB 5.2.1 Laying Of Glazed Ceramic Wall Tiles

The tiles shall be fixed direct to walls in 3:1 cement mortar with horizontal and vertical joints continuous, and shall have all joints rubbed in solid with neat white cement grout. Tiles shall be well soaked in water before fixing and thoroughly cleaned off after fixing.

Unless otherwise specified, the wall tiling shall project approximately 4 mm beyond face of adjoining plaster with all exposed edges finished with glazed rounded edge tiles.

Tiling shall be returned into reveals of openings and on to window sills, and shall be butted at internal angles and provided with glazed rounded edged tiles to external angles, unless otherwise specified.

All necessary cutting to tiles shall be properly performed.

Walls shall be well wetted before tiling is commenced.

PB 5.2.2 Laying Of Ceramic Floor Tiles

Ceramic tiles shall be bedded to a true and even surface on 3:1 cement mortar and with joints not exceeding 2 mm wide.

After the tiles have been allowed to set for a period of not less than twenty four hours the joints shall be grouted in to with approved epoxy compound, or acid proof cement mortar.

PB 5.3 Plasterer and paver

PB 5.3.1 Cement Plaster

Cement plaster for one coat work on walls shall be composed of four parts of sand and one part of cement for internal work, and five parts of sand and one part of cement for external work, all by volume, and mixed as described for cement mortar in clause 5.1.1.

Cement plaster on concrete surfaces shall be composed of three parts by volume of sand and one part by volume of cement.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB 5.3.2 Forming Key to Concrete for Plaster Finish**

All surfaces of concrete receiving plaster, or similar finishing's, shall be well wetted and wire brushed immediately after the formwork is removed and slushed over with 2:1 cement grout to form key for the finish, to the approval of the Engineer. The slushing to be allowed to set hard before the finish is applied.

Other methods may be used if approved by the Engineer.

Particular care shall be taken in forming the key for plaster where steel shuttering is used, and if considered necessary the surface of the concrete shall be hacked.

PB 5.3.3 Thickness Of Plaster

Plaster on walls shall be not less than 12 mm or more than 20 mm in thickness, and plaster on concrete ceilings and beams shall be not less than 9 mm or more than 16 mm in thickness, unless otherwise specified.

PB 5.3.4 Application Of Plaster

Walls shall be well wetted before plastering is commenced.

The surfaces of internal plaster shall be steel trowelled to a smooth, even and true finish. External plaster shall be finished to a true and even surface with a wood float. All plaster surfaces shall be free from blemish.

Plaster shall be returned into reveals and soffits of openings, and all angles shall be true and straight with salient angles slightly rounded.

The rendering coat of plaster in two coat work shall be approved by the Engineer before the setting coat is applied, and notice shall be given to the Engineer when it is ready for inspection.

All cracks, blisters and other defects shall be cut out and made good and the whole left perfect at completion.

NB - See clause 5.3.2 for forming key for plaster on concrete.

PB 5.3.5 Normal Screeds to Floors

Concrete sub-floors finished with wood mosaic, vinyl sheeting and tiles, and similar finishing's, shall be screeded with 3:1 cement mortar, of thickness required, but in no case less than 12 mm, and steel trowelled to a true and smooth surface suitable to receive finishing's.

The screeding shall be laid before the concrete sub-floors have matured otherwise the exposed surfaces of concrete shall be thoroughly cleaned with a wire brush, and a coat of neat cement grout applied immediately before the screeding is laid.

The screeding shall be laid in good time to allow of it being perfectly dry when the finishing's are laid.

No traffic shall pass over nor shall any building operations take place on the screeding without proper covering first being provided.

PB 5.3.6 Granolithic Screeds

Granolithic screeds shall be composed of two parts by volume of cement and three parts by volume 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.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Granolithic screeds to floors, treads of steps, thresholds, and similar horizontal surfaces unless otherwise specified, shall be not less than 25 mm thick. Granolithic screeds to stair risers, sides of kerbs, and other vertical surfaces, shall, unless otherwise specified, be not less than 20 mm thick. Exposed salient angles of granolithic screeds shall be neatly rounded to approximately 20 mm radius, unless otherwise specified.

The granolithic screeds shall be laid before the concrete sub-floor has matured otherwise the exposed surface of concrete shall be thoroughly cleaned with a wire brush, and a coat of neat cement grout applied immediately before the granolithic screed is laid.

The granolithic screeds shall be laid in panels not exceeding 9 m² in area, and joined to lines of panels and lined into smaller squares as directed with sunk V-joints. The joints between the panels shall coincide with joints in the concrete sub-floor where possible.

Where granolithic screed is to be tinted it shall be laid in two layers, a lower layer laid to within 6 mm of the finished level, and an upper layer into which the requisite quantity of approved colouring pigment shall have been mixed. **No dusting on of colouring material will be allowed.**

All granolithic work shall be done by experienced workmen, and shall be protected from injury caused by rain or other extreme weather for twelve hours after being laid, and against too rapid drying whilst hardening, by being covered with wet sacks, or other suitable material, and shall be protected from injury and discolouration during the progress of the remaining work.

Edges of granolithic floors butting against different floor finishing's, and edges of margins, etc. shall be true and sharp, and shall be protected by fixing temporary wood strips, which shall remain, in position until the commencement of the laying of the adjoining flooring material.

PB 5.3.7 Reedings To Steps, Etc.

The treads of granolithic finished steps and upper surfaces of granolithic finished external thresholds shall be rendered non-slip by reeding same near front edges for a width of 100 mm stopped 100 mm from ends.

PB 5.3.8 Power Floated Finish

Power floated finish to floors etc., unless otherwise specified, shall be floated mechanically to smooth and even surfaces before the concrete has set. Small surfaces and inaccessible places to be floated by hand in a similar way. Under no circumstances is cement mortar to be added while floating the concrete.

PB 5.3.9 Laying Of Concrete Paving Slabs And Paving Bricks

Concrete paving slabs and paving bricks shall be bedded and jointed on a layer of 30 mm clean dry river sand. Joints shall be 6 mm wide, continuous in both directions, filled solidly with 3:1 cement mortar and slightly pointed with a round jointing tool. Lengths in excess of 10 metres shall be provided with expansion joints.

PB 5.4 Waterproofing

PB 5.4.1 Damp-Proof Course in Walls

The damp-proof course shall be the full thickness of walls above foundations and shall be laid without longitudinal joints. At end joints, angles and intermediate junctions the sheeting shall be lapped 150 mm.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Where so specified all laps in the damp-proof course shall be sealed over the whole area of laps, to an approved method. Care shall be taken not to tear or otherwise damage the sheeting.

PB 6.4.1 Damp-Proof Membrane

The damp-proof membrane under floors, etc., shall be laid in the widest practical widths to minimise joints and shall be turned up, dressed to load bearing walls and if applicable lapped with the damp-proof course in the walls. All joints shall be sealed with pressure sensitive tape applied over the leading edge of the joint.

PB 7.4.1 Expansion Joints

Expansion joints shall be at least 10 mm wide and filled in with approved bitumen impregnated soft board or closed cell expanded polyethylene strip. Expansion joints shall be sealed with a two component poly-sulphide joint sealer, 12 mm deep, according to instructions of the manufacturers.

PB 8.4.1 Carpenter and joiner

PB 9.4.1 Protection Of Timber on Site

Timber stored on site shall be properly stacked when received, and adequately protected against extremes of weather and exposure to the sun, until required for use.

PB 10.4.1 Wrought Faces

Exposed woodwork, unless otherwise specified, shall be wrought to a smooth surface, and properly sand-prepared to remove all machine or other tool marks.

For each wrought face on structural timber, an allowance will be made off the "nominal" dimensions specified or stated on the drawings, as follows:

- (a) 2,5 mm for "nominal" dimensions up to and including 76 mm;
- (b) 3,5 mm for "nominal" dimensions over 76 mm.

For each wrought face on joinery timber, an allowance will be made off the "nominal" dimensions specified or stated on the drawings, as follows:

- (a) 3 mm for "nominal" dimensions up to and including 76 mm;
- (b) 5 mm for "nominal" dimensions over 76 mm.

The above will be the nett allowances permitted off the "nominal" dimensions specified or stated on the drawings and will not be additional to the tolerances specified for sawn timbers.

All exposed angles of wrought woodwork, unless otherwise specified, shall be arris rounded. The term "arris rounded" denotes that the angles shall be rounded off to approximately 3 mm radius.

Angles of wrought woodwork specified to be angle rounded shall be rounded off to 6 mm radius, unless otherwise shown on the drawings, and shall include, in framed joinery, for housed and mitred joints.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB 11.4.1 Lengths Of Timbers and Methods of Jointing**

Plates, purlins, battens, laths, slats, etc., shall be in single lengths, but where this is not possible the end joints will be formed as described below. The jointing of plates, battens, etc. at junctions and angles shall also be formed as stated hereunder, viz:

- (a) Wall plates shall be halved at joints and well spiked together, and also at junctions and angles;
- (b) Purlins shall be splayed or spliced at joints and, unless otherwise specified, using timber side plates of the same dimensions as purlins, not less than 600 mm long and four times bolted with M10 mild steel bolts, with two washers each. Adjacent purlins shall not be splayed or spliced in the same bay or on the same rafter;
- (c) Sawn battens, laths, slats, etc., shall be butt jointed at heading joints and angles, and wrought battens, laths, slats, etc., shall be splayed at heading joints and mitred at angles, all over points of support and where adjacent, shall not be jointed on the same rafter.

PB 5.5.4 Joints In Roof Trusses

- (a) The number of connecting devices to be used at each intersection between two members at any heel joint or any splice in a truss shall be determined from the following table:

SPAN m	3 (90 x mm) NAILS PLUS M10 BOLTS AS SPECIFIED BELOW	M16 BOLTS ONLY	50 mm TOOTHED RING CONNECTIONS
3	2	2	1
4	3	2	1
5	3	2	2
6	4	3	2
7	5	3	2
8	5	3	2
9	6	4	3
10	6	4	3

- (b) In the case of any joint other than a heel joint or splice, one M10 bolt plus three 90 x 4 mm nails shall be used.

PB 5.5.5 Prefabricated Roof Trusses

Prefabricated timber roof trusses shall be constructed of South African pine as described in clause 3.17 to the designs shown on the detail drawings. The timber shall be of cross-sectional dimensions shown, cut to correct lengths with ends square or cut to the required angle, and shall be assembled in truss fabricating jigs with the truss having the proper camber, and tightly clamped together and joints secured with approved connector plates of galvanised steel sheet, pressed into the timber simultaneously on both sides of the truss with hydraulic press capable of exerting such pressure as will ensure complete penetration of the teeth into the timber. The connector plates shall be of such size as will ensure that the joints so made will adequately withstand the forces exerted on the joints, and to have at least two coats Epoxy Tar finish for coastal areas.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB 5.5.6 Valleys In Roofs**

Valleys in roofs covered with galvanised steel or fibre roofing sheets or with roofing tiles shall each be formed with two 228 mm x 25 mm sawn boards, spiked down to roof timbers, and purlins fixed along outer edges where in galvanised steel and fibre sheet covered roofs and battens along outer edges where in tile covered roofs.

PB 5.5.7 Purlins

Unless otherwise specified, purlins shall be 50 mm x 76 mm and shall be securely nailed to roof timbers at not exceeding 1,14 m centres, ranging perfectly straight and square to the roof with but joints at heading joints and angles and in the case of wrought purlins splayed joints at heading joints and mitred joints at angles.

PB 5.5.8 Brandering To Ceilings

The brandering shall be 38 mm x 38 mm, securely spiked up to the supporting timbers with 88 mm wire nails at 380 mm centre-to-centre. Cross brandering shall be cut in between the longitudinal brandering and securely skew nailed to same with 75 mm wire nails at joints in ceilings and at edges where required for fixing of cornices.

PB 5.5.9 Steel Roofing Sheets

The sheets shall be secured to wood purlins with approved galvanised iron roofing screws each provided with a plastic or asphalt felt washer and a galvanised steel cup washer over the plastic or felt washer and secured to steel purlins with M6 galvanised hook bolts, provided with similar washers under nut.

Screws and bolts at ends of sheets and at end laps shall be spaced at not exceeding two corrugations apart wherever possible, but in no case more than three corrugations apart, and at intermediate purlins at not more than four corrugations apart; screws or bolts shall, in all cases, be provided in the outermost corrugations of the upper sheets.

All necessary cutting to sheets shall be properly performed. Cut edges at sides of valleys, and elsewhere exposed, shall be perfectly straight.

At exposed verges of roofs the iron shall be finished with neatly formed rolls.

The sheets shall have side laps of not less than one and a half corrugations. The minimum roof slopes and sheet end laps shall be, unless otherwise specified, as prescribed in Table 2 of Schedule 2 of Part L of the National Building Regulations and Building Standards Act, 1977.

PB 5.5.10 Metal Ridging For Steel Covered Roofs

The ridging shall be 450 mm girth with roll top and bent down edges, and shall be lapped 225 mm at end joints, cut and properly lapped and fitted at intersections of ridges, hips and valleys, and close beaten into corrugations of roofing iron. Roll shall be closed at feet of hips and at end of ridging.

Ridging shall be fixed with screws to wood purlins and hook bolts to steel purlins, with washers under heads and nuts, respectively, all as described for fixing roofing sheets, and spaced at not exceeding 300 mm centres.

PB 5.5.11 Fibre Cement Roofing Sheets

The sheets shall be mitre-cut at corners as necessary and laid with smooth surface on top, and shall be secured to wood purlins with 7 mm diameter galvanised drive screws not less than 114 mm long, and to steel purlins with M8 galvanised hook bolts, each provided with a

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



plastic or asphalt felt washer and a galvanised steel cupped washer over the plastic or felt washer.

Screw and bolt holes in sheets shall be drilled (not punched), and shall be 0,2 mm larger than the diameter of screws and bolts.

The fixing screws, and nuts on fixing bolts, shall not be tightened more than is necessary for the holding down of the sheets and for the proper seating of the washer over the corrugations, so as to allow for slight movement between the sheets and the supporting structure. On no account shall sheets be deflected at the intermediate purlins in an attempt to make the sheets bear on such purlins.

The side laps of sheets shall be sheltered from the prevailing wind by laying the sheets from left to right, or from right to left, depending on the direction of the prevailing wind, the sheets being laid in the opposite direction to that of the wind.

All necessary cutting to sheets shall be properly performed. Cut edges at sides of valleys, and elsewhere where exposed, shall be perfectly straight.

The minimum roof slopes and sheet end laps shall be, unless otherwise specified, as prescribed in Table 1 of Schedule 2 of Part L of the National Building Regulations and Building Standards Act, 1977.

The manufacturer's instructions regarding laying and fixing of sheets, including side laps, mitring of corners and spacing of screws or bolts, shall be followed in all cases.

One month after fixing, the roof covering shall be thoroughly examined, any defects made good and loose screws or bolts tightened.

Roof boards shall be used by all workmen for safety and to avoid damage to the sheeting.

PB 5.5.12 Adjustable Fibre Cement Ridging

The ridging shall be secured to wood purlins with screws and to steel purlins with hook bolts, passed through the roofing sheets, and provided with plastic or felt and steel washers, all as described for fixing fibre cement roofing sheets.

The manufacturer's instructions regarding laying and fixing of the ridging, including spacing of screws or bolts, shall be followed in all cases.

PB 5.5.13 Fascias And Barge Boards

Fascias and barge boards of pressed fibre cement boards shall be butt jointed with 75 mm wide x 3 mm thick galvanised steel plates four times bolted with M6 galvanised bolts over joints.

PB 5.5.14 Fibre Cement Flashings

Fibre cement flashings shall be secured to wood purlins with screws and to steel purlins with hook bolts, passed through the roofing sheets, and provided with plastic or felt and galvanised steel cupped washers, all as described for fixing fibre cement roofing sheets.

The manufacturer's instructions regarding fixing of the flashings, including spacing of screws or bolts shall be strictly adhered to.

PB 5.5.15 Fibre Cement Gutters

Fibre cement gutters shall be bedded in approved bituminous mastic compound and secured with M6 galvanised gutter bolts with heads of bolts on inside of gutters and each bolt provided with asphaltic felt and galvanised steel washer under head and nut, all in accordance with the manufacturer's instructions. The inside surfaces of sockets and the outside surfaces of

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



spigot ends shall be coated with a thin solution of bitumen to enable the compound to adhere fast when applied, and surfaces of washers in contact with each other and with gutters shall be coated with bitumen. After tightening the bolts, all surplus compounds from the joints shall be removed, and the joints externally finished with neatly trowelled fillets of 2:1 cement mortar.

The spigot ends of gutters shall be lapped on to the socket ends in the direction of the flow wherever possible.

The gutters shall be fixed with proper falls on gutter brackets of the fascia type where fixed to fascia boards and of the purlin type where fixed to purlins. Brackets shall be securely screwed to the roof timbers, at not exceeding 1 m centres, and with extra brackets at angles and outlets.

Gutters shall be provided with all necessary angles, stopped ends, outlet nozzles, etc., jointed to gutters as described above.

PB 5.5.16 Fibre Cement Rainwater Down Pipes

Fibre cement rainwater downpipes shall be jointed with tarred hemp rope gasket caulked into each joint, and the joint filled with a suitable bitumen compound and finished off with neatly trowelled fillet of 2:1 cement mortar.

The pipes shall be fixed to walls with holderbats, bolted around pipes immediately below the socket, and with tails built into walls in 3:1 cement mortar.

Rainwater downpipes shall be provided with all necessary swan necks, branch pieces, plinth bends, radius bends, shoes, etc., jointed to pipes as described above.

PB 5.5.17 Concrete Roofing Tiles

Tiling shall be "straight or broken bond", and vertical joints between tiles and bottom edge of each course of tiles shall range perfectly straight. Unless otherwise specified, interlocking tiles shall be laid to a lap of at least 100 mm and plain tiles to a lap of at least 62 mm.

Half tiles in the case of interlocking tiles, and tile and a half in the case of plain tiles, shall be provided as required at abutments and at verges of roofs. Plain tile roofs shall be provided with double course at eaves.

Unless otherwise specified, each tile in every third course in the case of interlocking tiles, and in every fifth course in the case of plain tiles; all tiles in eaves courses and ridge courses; end tiles in every course at each side of hips and valleys; all tiles adjoining bonnet hip tiles in plain tile roofs; half tiles, full tiles and tile and a half at verges, and all tiles to open eaves and open overhanging verges, shall be fixed to the battens with galvanised nails of such length as will penetrate the battens to a depth of at least 25 mm.

Tiling shall be carefully cut and dressed at hips and valleys and, where necessary at abutments, etc. Mitred portions of tiles at hips and valleys shall be holed and properly secured.

Hip and ridge tiles for interlocking tile roofs shall be socketed V-type, shall match general tiling, and shall be bedded solid in 3:1 cement mortar with strip of approved bituminous sheeting laid under the mortar bedding, of such width as will give a lap of at least 25 mm on to the roof tiling at each side, and lapped not less than 75 mm at end joints. Socketed joints of hip and ridge tiles shall be bedded in mortar as above and pointed with neatly recessed joints, and hip iron of 25 mm x 4,5 mm mild steel 300 mm long, suitably bent, twice holed and securely nailed to hip rafter, shall be provided at foot of each hip. The mortar bedding shall be trowelled smooth at open ends of ridges.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Ridge tiles for plain tile roofs shall be as above but half-round and but jointed and neatly pointed in tinted 3:1 cement mortar, and hip tiles shall be round pattern bonnet type, to course and bond in with general tiling, and with each tile bedded and neatly pointed in mortar as above and nailed to hip rafter with galvanised nail.

Hip and ridge tiles shall be neatly cut and fitted together at junctions between ridges and hips or valleys, and shall be bedded solid and neatly pointed in tinted 3:1 cement mortar with approved bituminous sheeting under the mortar bedding, cut to shape required and with lap of 25 mm on to the roof tiling.

PB 5.5.18 Covering To Ceilings

(a) Gypsum plasterboard ceilings with plaster finish

The ceiling boards shall be in 900 mm or 1 200 mm widths, with board at ends of ceilings of widths required to suit length of ceilings. Ceiling board shall be in single lengths to the width of ceilings wherever possible.

The boarding shall be nailed to the bracker, with GREY surface to underside, with 2 mm diameter galvanised or cadmium plated clout headed nails, 38 mm long, spaced at not more than 100 mm apart at edges of boards and 150 mm apart along the intermediate bracker.

The joints between boards shall be loose butt joints and covered with wire gauze strips nailed through the boarding to the bracker at 400 mm centres with 38 mm galvanised clout headed nails.

The bonding plaster shall be applied in two layers by the trowel-float-method to a total thickness of not less than 6 mm, and well pressed into the wire scrim over the joints between the ceiling boards, and finished smooth, even and true.

(b) Fibre cellulose board ceilings

The ceiling boards shall be in the same widths, and fixed as specified for gypsum plasterboard ceilings in paragraph (a).

The joints between the boards shall be covered with 25 mm half-round wood cover beads fixed with 38 mm long nails spaced at not exceeding 300 mm.

PB 5.5.19 Cove Cornices to Ceilings

(a) Gypsum plasterboard cornices

Cove gypsum plasterboard cornices shall be nailed through the ceiling boards to the bracker and to wall plugs, at not exceeding 200 mm centres, with 2 mm diameter galvanised or cadmium plated clout headed nails, 38 mm long, or fixed to walls with hardened steel nails driven into the brickwork.

Cornices shall be scribed at internal angles and mitred at external angles and shall be in long lengths with splayed heading joints where necessary.

(b) Timber cornices

Scotias shall be fixed to walls with hardened steel nails driven into the brickwork.

PB 5.5.20 Trapdoors In Ceilings

Openings for trapdoors in ceilings shall be formed with 38 mm x 38 mm bracker all around each opening, spiked together and to bottom edge of the supporting timbers. Size of opening, unless otherwise specified, shall be 650 mm x 650 mm.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Trapdoor shall be formed with skeleton frame of 50 mm x 38 mm brandering, covered on underside with boarding as for ceiling, and hung on a pair of 75 mm steel butts and fitted on underside near closing edge with 100 mm brass bow handle. Soffit of trapdoor shall be flush with soffit of ceiling when closed, and trapdoor shall flap back on to top of the brandering, between tie beams or ceiling joists when open.

When trapdoor is closed it shall rest on 50 mm x 19 mm fillets, fixed on soffit of ceiling all around opening, mitred at angles and securely screwed up to the trimmers. Fillets shall project 12 mm into the opening to carry the trapdoor.

Trapdoors larger than 650 mm x 650 mm shall each be provided with 38 mm x 38 mm brandering across centre, spiked to the skeleton frame.

PB 5.5.21 Ceiling Insulation

Ceilings shall be insulated, where so specified, with approved resin bonded or stitched fibre glass or mineral wool insulation blanket 38 mm thick, cut to size and laid over brandering between ceiling joists and tie beams, etc.

Where insulation is to be in two thicknesses a total thickness of 76 mm is required and the joints shall be staggered.

PB 5.5.22 Framed Joinery

Where the word "Framed" is used it is to include for all mortice and tenon joints, dovetail joints, grooves, stop grooves, rebates, stop rebates, housings, notchings, etc., including housing ends of shelves, divisions, etc.

PB 5.5.23 Joinery

Joinery work shall be put in hand immediately after the order has been given to commence work, or after the receipt of detail, where such are to be supplied, and shall not be wedged or glued up until just before fixing in the building.

No framed joinery for services situated inland shall be manufactured in the humid coastal belt, and no framed joinery for the services situated in the coastal belt shall be manufactured inland. This applies to both purpose made and stock joinery.

All exposed softwood timber in joinery which is not to be painted shall be free from large, loose or dead knots, knot holes, checks, splints, wane or other defects, and in joinery which is to be painted shall be free from all defects other than those which can be filled or otherwise made good in such a way as will not impair the paint finish. All exposed hardwood joinery timber shall be free from all knots, knot holes, checks, splints or other defects and, unless otherwise specified, shall also be free of sapwood.

Purpose made joinery shall be manufactured strictly in accordance with detail drawings.

Stock joinery shall be of approved quality. Joinery shall not be primed until it has been inspected and approved.

Skirting, rails and the like shall be in long lengths. Heading joints where necessary shall be splayed. Counter tops, table tops, drainers, and the like, shall be formed with wide boards, jointed with grooved, cross-tongued and glued joints or with grooved rebated and glued joints of approved type; cross-tongues shall be stopped 25 mm back from ends where ends are exposed to view. The boards shall be in single lengths to top, etc., but where this is not possible the heading joints shall be staggered and jointed as above.

Skirting, rails, angle moulds and beadings of all kinds, shall be close fitted, mitred or scribed at angles, and securely fixed; skirtings, rails and the like shall be fixed with hardened steel or other suitable nails driven into the brickwork or shall be nailed to wall plugs spaced at not

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



more than 700 mm apart. Glazing beads and the like shall be mitred at angles and, unless otherwise specified, shall be fixed with panel pins.

PB 5.6 Metalwork

PB 5.6.1 Manufactured Steelwork Generally

Welding is to be done electrically in the most up to date manner by skilled workmen and cleaned off on completion.

All welds are to be welded with welding rods of the same chemical composition as the tubes, rods, bars, etc., to be welded and all external welds are to be filed clean and smooth.

Welding to be continuous fillet welding to all exposed edges unless otherwise described.

No scaffolding shall be allowed to rest on or fixed to steel windows, doors, frames, etc., in any way.

PB 5.7 Resilient floor finishings

PB 5.7.1 Laying And Fixing

Vinyl sheeting and tiles and such like floor finishing's shall be laid in strict accordance with the manufacturer's instructions, on a perfectly dry and clean screeded surface, using an adhesive supplied or recommended by the manufacturer of the flooring material, and rolled with a suitable roller to ensure complete adhesion of the material. The flooring shall be cut where required and neatly fitted against adjoining floors, thresholds, etc. Vinyl skirtings shall be close fitted to floors and walls, butted at end joints, neatly mitred at internal angles and dressed round external angles, and fixed with adhesive as for flooring.

Unless otherwise described, sheet flooring shall be in standard widths with cut sheets at sides of floors as necessary.

PB 5.8 Glazier

PB 5.8.1 Fixing Of Glass

Glass fixed with glazing beads in unpainted hardwood doors shall be bedded on strips of rubber, velvet, leather, or felt turned over on to both sides of glass in the rebates to form a soft packing between the glass and the woodwork. In all other cases the glass shall be well bedded in back putty in the rebates.

Glass rebates, other than in unpainted hardwood doors, shall be primed before glazing.

Glass panes exceeding 0,5 m2 in surface area and fixed with putty only in wood doors, sashes and the like shall be secured in addition with glazing sprigs, and in steel windows and doors with glazing pegs or clips inserted in holes in the steel framing.

Glass panes shall have adequate clearance between the edges of glass and the rebates.

Putty shall be carefully trimmed and cleaned off with front putty worked to within 3 mm of the sight lines.

PB 5.9 Painter

PB 5.9.1 Preparatory Work

(a) General

All floors must be swept clean and walls dusted down, and surfaces not being painted such as face brickwork, sills, floors and stained woodwork covered up and protected against spotting, before any painting is commenced.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



No sweeping or dusting shall be done whilst painting is in progress or whilst paint is still wet.

(b) **On woodwork**

Woodwork being painted shall be well brushed down, knots treated with knotting, and all surfaces primed, stopped with hard stopping and rubbed down to an even surface ready to receive the paint.

Woodwork being oiled or stained shall have all plaster stains, pencil marks and other surface discolourations and blemishes carefully removed, and stopped with tinted stopping and well rubbed down.

(c) **On metalwork**

All metal surfaces being painted, except steel structures shall be cleaned of all rust, scale and dirt by scraping or by means of steel wire brushes; also all oil and grease shall be removed and a perfectly clean surface obtained. If necessary, the surface shall be decreased immediately before applying the priming coat, by the use of a suitable grease-removing solvent; any salt deposits on the metal surfaces as may occur in industrial and marine atmospheres shall be removed by the use of a suitable detergent and the surface then thoroughly rinsed and allowed to dry.

New galvanised metal surfaces and surfaces of all non-ferrous metals, which are to be painted, shall be cleaned down as above and given one coat of wash primer (metal etch primer).

Protective coatings on new galvanised metal surfaces, applied by the manufacturers to prevent storage stain and white rust, shall be completely removed by the use of a suitable cleaning agent and the surfaces thoroughly rinsed and allowed to dry, before the surfaces are primed or painted.

After cleaning off rust on metalwork those portions so affected shall be treated with an approved rust inhibitor.

(d) **On plaster**

All plastered wall, ceiling and such like surfaces being painted or distempered shall be filled where necessary with suitable stopping or patching plaster and the whole rubbed down ready to receive the finishing.

(e) **On ceilings**

Boarded ceilings, cover strips and cornices being painted or distempered, shall be filled where necessary with suitable stopping and all nail heads in ceilings, cover strips and cornices being distempered shall be primed with flat paint.

(f) **On block work**

All block work shall be cleaned down to remove all loose and dusty matter, prior to being heated with finishing.

PB 5.9.2 Surfaces To Be Dry

All plastered wall, ceiling and similar surfaces shall be perfectly dry and in a fit state to receive the finishing, before the work is put in hand.

PB 5.9.3 Priming

Wood, metal and other surfaces normally primed before being painted shall be prepared and primed as before described in readiness to receive the specified paint system.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Backs of wood door and similar frames and surfaces of other new or re-fixed joinery in contact with brickwork, etc., and built in as the work proceeds, shall be primed before building in whether the articles are to be painted or not, to prevent moisture seeping into the wood from the mortar bedding.

Wood surfaces shall be knotted, primed and stopped before being coated with emulsion paint or distemper.

Tongued and grooved and rebated edges of boards in batten doors, and other suchlike inaccessible parts of joinery shall, before the joinery is assembled, be primed or where the joinery is to receive a finish other than paint, be given one coat of such other finishing material.

Priming to external structural timbers shall be applied before the timbers are fixed in position and shall include all wrought surfaces, such as backs of fascia and barge boards.

PB 5.9.4 **Application Of Paint**

All coats of paint shall be thoroughly dry before subsequent coats are applied and rubbed down where necessary.

All work shall be finished to colour approved by the Engineer. The tints of undercoats shall approximate those of the finishing colour and in order to indicate the number of coats applied and to avoid misses when applying a succeeding coat, a slight difference shall be made in tint of each coat.

Priming on wood surfaces shall be by brush application. Priming on surfaces other than wood shall be by brush application or if in the opinion of the Engineer, the primer and the surfaces are considered suitable for roller application, the primer may be so applied. Priming applied by brush application shall be well brushed in to obtain maximum penetration.

Undercoat and finishing coats may be applied by brush or roller.

The use of spray gun on site for application of paint will not be permitted, except in the case of cellulose and other special cases where spraying is the accepted method of application; in cases where spraying is permitted all surrounding surfaces shall be properly masked.

The finishing coat on woodwork and metalwork, unless otherwise specified, shall be of high gloss paint. All materials shall be used in strict accordance with the manufacturer's instructions.

PB 5.10 **Protection and cleaning of works**

The Contractor shall provide all necessary dust sheets, covers, etc., and shall exercise all necessary care to prevent marking surfaces of walls, floors, ceilings, glass, electrical fittings, etc., and shall keep all parts of the works perfectly clean and free at all times from spotting, accumulation of rubbish, debris or dirt arising from the operations. Any surface disfigured or otherwise damaged shall be completely renovated or replaced as necessary, to the Engineer's approval, by the Contractor at his own expense.

The Contractor shall test all doors, fanlights and windows and all other fittings for proper operation and effect the required rectification prior to the handing over of the building.

The premises shall be left clean and fit for occupation at the completion of the work.

PB.5.11 **Plumbing and drainage supplementary preambles**

PB.5.11.1 **"Polycop" polypropylene pipes**

Polypropylene pipes 54mm diameter and under shall be seamless copper coloured class 16 pipes with "Fast-fuse" heat welded thermoplastic or brass compression fittings as designed for use with copper pipes as stated

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Pipes shall be firmly fixed to walls etc. with coloured nylon snap-in pipe clips with provision for accommodating thermal movement and jointed and fixed strictly in accordance with the manufacturer's instructions

All pipes' diameters are nominal external

PB.5.11.2 **"Polyink" polypropylene pipes**

Polypropylene pipes 63mm diameter and over shall be class 12 pipes jointed with cast iron "Supaclamp" running joints.

Fusion welded bends, once or twice mitred as necessary, and tees shall be factory manufactured.

Fusion welded bends and tees shall include jointing to pipes with PVC rubber ring double Z joint couplers.

Branch tees shall include flanged and bolted joints to "Polycop" branch pipes in addition and for brass compression male iron to copper straight couplers.

Reducers shall be including jointing to pipes with PVC rubber ring Z joint couplers and reducers shall be of sufficient overall length to accommodate same.

All pipes shall be jointed and fixed strictly in accordance with the manufacturer's instructions.

All pipe diameters are nominal external.

PB.5.11.3 **uPVC pipes and fittings**

Sewer and drainage pipes and fittings shall be jointed and sealed with butyl rubber rings.

Soil, waste and vent pipes and fittings shall be solvent weld jointed uPVC pressure pipes and fittings.

Pipes for water supply shall be of the class stated.

Pipes of 40mm diameter and smaller shall be plain ended with solvent welded uPVC loose sockets and fittings.

Pipes of 50mm diameter and greater shall have sockets and spigots with push-in type integral rubber ring joints. Bends shall be uPVC and all other fittings shall be cast iron, all with similar push-in type joints.

PB.5.11.4 **Copper pipes**

Pipes shall be hard drawn and half-hard pipes of the class stated. Class 0 (thin walled hard drawn) pipes shall not be bent. Class 1 (thin walled half-hard), class 2 (half-hard) and class 3 (heavy walled half-hard) pipes shall only be bent with benders with inner and outer formers. Fittings to copper waste, vent and anti-syphon pipes, capillary solder fittings and compression fittings shall be "Cobra Watertech" type. Capillary solder fittings shall comply with ISO2016. Only compression fittings shall be used in walls and ground.

All soldered joints shall be wiped and brass unions shall be used for jointing lead to steel.

PB.5.11.5 **Reducing fittings**

Where fittings have reducing ends or branches, they are described as "reducing". In the case of pipes with diameters not exceeding 60mm only the largest end or branch size is given. Should the contractor wish to use other fittings and bushes or reducers he may do so on the understanding that no claim in this regard will be entertained. In the case of pipes with diameters exceeding 60mm all sizes are given and no claim for extra bushes, reducers, etc. will be entertained.

PB.5.11.6 **Wire gratings**

Descriptions of gutter outlets etc. shall be deemed to include wire balloon gratings.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB.5.11.7 Exposed concrete surfaces**

Exposed surfaces of concrete storm-water channels, cover slabs, inspection eye markers slabs, gully tops, cleaning eye tops, catch pits, inspection chambers, etc. shall be finished smooth with plaster.

PB.5.11.8 Excavations

No claim for rock excavation will be entertained unless the contractor has timeously notified the principal agent thereof prior to backfilling.

"Soft rock" and "Hard rock" shall be as defined in "Earthworks"

PB.5.11.9 Laying, backfilling, bedding, etc. of pipes

Pipes shall be laid and bedding and trenches shall be carefully back filled in accordance with manufacturers' instruction.

Where no manufacturers' instructions exist pipes shall be laid in accordance with clauses 5.1 and 5.2 of each of the following: SABS 1200 L: medium-pressure pipelines LD: Sewers LE: Storm-water drainage pipe trenches etc. shall be backfilled in accordance with clauses 3, 5.5, 5.6, 5.7 and 7 of SABS 1200 DB: Earthworks (Pipe trenches) Pipes shall be bedded in accordance with clauses 3.1 to 3.4.1, 5.1 to 5.3 and 7 of SABS 1200 LB: Bedding (Pipes). Unless otherwise described bedding of rigid pipes shall be class B bedding.

PB.5.11.10 Stainless steel basins, sinks, wash troughs, urinals, etc.

Units shall have standard aprons on all exposed edges and tiling keys against walls where applicable.

PB.5.11.11 Waste unions

Descriptions of waste unions shall be deemed to include rubber or vulcanite plugs and clains fixed to fittings.

PB 6 TOLERANCES**PB 6.1 Basis of measurement****PB 6.1.1 General**

Permissible deviations will apply in the case of linear dimensions, position, and level. The Contractor shall construct each of the various parts of the works within the limits of the applicable permissible deviations set out in clause 6.2 unless some other degree of accuracy is required in terms of the project specification or is shown on the drawings.

PB 6.1.2 Methods Of Measurement Of Deviations

Certain deviations will be measured as set out below:

- (a) Any deviation from flatness of a plane surface, will be measured as the maximum deviation of the surface from any straight line of length 3 m joining two points on the surface, determined by means of a straight edge the ends of which are supported on identical blocks of suitable thickness placed one over each of the points.
- (b) Any abrupt change in a continuous surface, including a local depression or peak in a floor or wall, will be measured as specified in (a) above.
- (c) Out-of-squareness of a corner or an opening or an element such as a column will be measured by taking the longer of two adjacent sides as the base line, and determining any departure from the perpendicular of the side at either end of this base line.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PB 6.2 Permissible deviations**

The permissible deviations for elements or components shall be as follows:

- (a) Position on plan of any edge or surface measured from the nearest grid line or agreed centre line $\pm 25 \text{ mm}$
- (b) Linear (other than cross-section) dimensions $\pm 30 \text{ mm}$
- (c) Cross-section dimensions $-10 + 20 \text{ mm}$
- (d) Level (deviation from designed level with reference to the nearest transferred datum (TD) of the upper or lower surface, as may be specified, of any slab or other element or component) $\pm 10 \text{ mm}$
- (e) Out-of-squareness of a corner or an opening or an element such as a column (See clause 6.1.2(c)) for short side of length:
 - (i) up to and including 0,5 m $\pm 5 \text{ mm}$
 - (ii) over 0,5 m up to and including 2 m $\pm 15 \text{ mm}$
 - (iii) over 2 m up to and including 4 m $\pm 20 \text{ mm}$
- (f) Exposed surface (including floor slabs and paving):
 - (i) Flatness of plane surface $\pm 5 \text{ mm}$
 - (ii) Abrupt changes in a continuous surface $\pm 5 \text{ mm}$
- (g) Exposed surface to be plastered or receive normal or granolithic screeds:
 - (i) Flatness of plane surface $\pm 10 \text{ mm}$
 - (ii) Abrupt changes in a continuous surface $\pm 5 \text{ mm}$
 - (iii) Surface of plaster and normal or granolithic screeds $\pm 5 \text{ mm}$

PB 7 TESTS**PB 7.1 GENERAL**

The Engineer shall have free access to the works for taking samples and carrying out tests. The Contractor shall render any assistance necessary. If so required, the Contractor shall provide storage and protection of such samples on site.

PB 8 MEASUREMENT AND PAYMENT**PB 8.1 GENERAL**

PB 8.1.1 All items in this section will be measured by number, square metre or linear metre completed and the tendered rates shall include full compensation for the supply, delivery, handling and installation of all materials, the provision of all necessary labour and supervision, transport, plant, equipment and incidentals necessary to complete, protect and maintain the works as specified or as shown on the drawings.

PB 8.1.2 Where a lump sum is required for a complete structure, the tendered rate shall include all items and contingencies, as specified in this section or as shown on the drawings.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB 8.2 Scheduled items****PB 8.2.1 Brickwork Unit: m²**

Brickwork will be measured on the centre line of the walls. Areas occupied in walls by windows and doors will be excluded from the areas measured, and corners and intersections common to more than one brick wall will be measured once only.

The rate shall cover the cost of brickwork complete as specified, including test sections where specified, pointing, providing brick lintels, brick reinforcement and ties, etc., the building in of conduits, beams, pipe sleeves, doors and windows, the raking out of joints and the filling of cavities in cavity walls and walls constructed of hollow concrete masonry units, below floor level and elsewhere where specified.

The test section for faced brickwork as specified in clause 5.1.14 shall only be paid for if approved by the Engineer and, if rejected, shall be removed at the Contractor's expense.

PB 8.2.2 Air Bricks

(a) External air bricks Unit: No

(b) Internal air bricks Unit: No

The rate shall cover the cost of providing and building in the air bricks as specified.

PB 8.2.3 Bagged Finish to Brickwork Unit: m²

The rate shall cover the cost of providing rough sacking, additional cement grout as required and finishing the bagging as specified.

PB 8.2.4 Window Sills

(a) External (describe) Unit: m

(b) Internal (describe) Unit: m

The rate shall cover the cost of providing and building in face bricks, fibre cement sheets or any other material prescribed, as well as all accessories specified.

PB 8.2.5 Tiling Unit: m²

The rate shall cover the cost of providing all material and the laying and grouting of tiles, complete as specified.

PB 8.2.6 Plaster Work Unit: m²

The rate shall cover the cost of the construction of the plaster work, including the supply of all materials, mixing, applying, finishing, forming reveals, joints, etc., complete as specified.

PB 8.2.7 Floor Screeds

(a) Normal screeds Unit: m²

(b) Granolithic screeds Unit: m²

The rate shall cover the cost of the construction of the floor screeds, including the supply of all materials, mixing, laying, finishing, the forming of nosings, reedings, skirtings, etc. and, where the concrete sub-floor has matured, of the brushing and applying a cement grout, complete as specified.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PB 8.2.8 Paving Unit: m²**

The rate shall cover the cost of providing paving slabs or bricks, sand bedding and joint filling and expansion joint material and of constructing the paving.

PB 8.2.9 Waterproofing

(a) Damp-proof course in walls Unit: m

(b) Damp-proof membrane under floors Unit: m²

The unit shall be the net length or area of waterproofing installed. The length or area of overlaps shall not be measured for payment.

The rate shall cover the cost of providing and laying all material as specified, including the sealing of all laps and joints, complete as specified.

PB 8.2.10 Expansion Joints Unit: m

The rate shall cover the cost of providing and installing all filling and sealing material and of the forming of expansion joints, complete as specified.

PB 8.2.11 Structural Timber

(a) Wall plates (indicate size) Unit: m

(b) Beams (indicate size) Unit: m

(c) Joists (indicate size) Unit: m

(d) Rafters (indicate size) Unit: m

(e) Purlins (indicate size) Unit: m

(f) Branderling (indicate size) Unit: m

(g) Roof trusses complete (indicate drawing number) Unit: No

(h) Roof complete (indicate drawing number) Unit: Sum

The rate shall cover the cost of the supply of all materials, manufacture, cutting, waste, laps, joints and fixing of the timber as indicated, including nails, bolts, nuts, washers, hoop irons, ties and other fixtures required, complete as specified.

PB 8.2.12 Roof Covering Unit: m²

The rate shall cover the cost of providing and fixing all roof covering material as prescribed, including all flashings, soakers, valleys, ridge coverings, roofing screws and all other fixtures required to complete the work, as specified.

PB 8.2.13 Fascias And Barge Boards Unit: m

The rate shall cover the cost of providing and fixing of all material, fixtures, screws, bolts, nuts, washers and other accessories required to complete the work, as specified.

PB 8.2.14 Gutters and Rainwater Down pipes

(a) Gutters Unit: m

(b) Rainwater downpipes Unit: No

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



The rate shall cover the cost of supply and building in of all material including angles, stopped ends, outlet nozzles, gutters, gutter brackets, etc. for gutters and swan necks, branch pieces, plinth bends, radius bends, shoes, brackets, etc. for rainwater downpipes, including all bolts and sealants, complete as specified.

PB 8.2.15 Ceilings

- (a) Ceilings Unit: m²
 (b) Cornices to ceilings Unit: m

The rate shall cover the cost of supply and installation of all material including cover strips to joints, nails, trapdoors and gypsum plaster where prescribed, complete as specified.

PB 8.2.16 Ceiling Insulation Unit: m²

The rate shall cover the cost of supply and installation of all material, as specified.

PB 8.2.17 Joinery

- (a) Doors (type and size indicated) Unit: No
 (b) Skirtings (size indicated) Unit: m
 (c) Other items (describe or indicate drawing number) Unit: No or m

The rate shall cover the cost of the supply of all material, manufacture, cutting, waste, fixing and installation of the joinery items, complete as specified.

The rate for doors shall also cover the cost of the door frames and all accessories, such as hinges, hooks, bolts, locks, latches, etc., and of damp-proof course on both sides and above door frames in cavity walls, as specified.

PB 8.2.18 Metalwork Unit: No

The rate shall cover the cost of supplying all material, manufacture, applying priming coat of paint or galvanising, as specified, delivery and building in of units, including burglar proofing where specified, locks, catches, glazing, etc., and of damp-proof course under all windows and on both sides and above frames in cavity walls, as specified.

PB 8.2.19 Resilient Floor Finishing

- (a) Vinyl-fibre, PVC, or thermoplastic floor tiles (specify) Unit: m²
 (b) Vinyl cove skirting Unit: m

The rate shall cover the cost of supplying all material and adhesives required and the laying of the floor finishing's.

PB 8.2.20 Painting..... Unit: No or m or m² or Sum

Only the surface covered by the final finishing coat shall be measured.

The rate shall cover the cost of surface preparation, supplying and applying all the coats of paint, repairing any damaged surfaces, and all materials necessary for completing the work.

PB 8.2.21 Electrical Installation Unit: Sum

The rate shall cover the cost of supplying and building in of all equipment such as switchboards, conduits, wires, cables, sockets, light fittings, etc., cutting recesses, chases

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



and holes in walls as required and repairing any damaged surfaces after installation, including testing of the installation.

PB 8.2.22 Miscellaneous Unit: No, Sum or m

The rate shall cover the cost of all workshop detail drawings, where prescribed, material, plant, tools and labour to complete the scheduled items complete, as detailed, including corrosion protection and/or painting, as specified, and building in.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



C3.4.2: MECHANICAL PROJECT SPECIFICATIONS

GENERAL NOTES

- a) The tenderer must include for the repair as specified. If during the “strip/dismantle”-stage, when the equipment is at the approved repair agent, it becomes evident for more extensive repair or replacement of other major parts, it will be managed on a assess, quote, and approve basis before the tenderer will be allowed to commence with additional repair or replacement of parts.
- b) The successful tenderer will be liable for a twelve (12) month guarantee on all repaired and commissioned equipment.
- c) The Electrical assessment must be compiled taking into consideration the test specification results as part of this contract documentation. The commencing of the priced repair work will be subjected to an inspection and approval by the Employer’s Agent.
- d) COMMISSIONING: Commissioning procedures will commence after required testing. The commissioning will follow the typical commissioning methodology, but will be finalized by the tenderer to make provision for the corresponding equipment, for the Employer’s Agent approval.
- e) VIBRATION TESTING: The tenderer must price to do field vibration testing, before removing and after re-installing the existing equipment (including the new equipment). This will be done to monitor vibration and rotational balancing conditions. If so required, repaired (and new) equipment must undergo the required balancing procedures.
- f) HANDELING OF WET CONDITIONS: The tenderer must at all times consider and provide in his prices to accommodate and handle the incoming raw sewage flow (and any storm water conditions).
- g) DEFINITIONS OF BILL OF QUANTITY TERM:
 - Remove/dismantle: The necessary actions to access and strip the equipment to be repaired as per the repair specification.
 - Transport to approved repair agent and back to site: The transportation, loading, safeguarding and cost as will be required to take the equipment to the approved repair agent and to return it back to site for installation and commissioning.
 - Inspect for major damage: The tender documentation requires the tenderer to price for the specified repair to the existing equipment, however, during the process of removing/dismantling and doing the specified repair work, the tenderer will be responsible to inspect and discover damage and faults which will influence or impair the equipment to be guaranteed for the 12-month retention period, both on site and at the approved repair agent’s workshop.
- h) STAINLESS STEEL PICKLING & PASSIVATION: All existing and new stainless-steel equipment will be treated according to the corrosion protection particular specification.
- i) LUBRICATION: All existing and new equipment will be supplied and refilled with the manufacturers specified lubrication (oils, greases and other required lubrication material).

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

MPS01 OXIDATION PUMPS**Scope**

This section of the specification includes the manufacture, delivery, transport, handling, protection, storage, installation, successful commissioning and upholding during the Defects Liability period of the oxidation Pumps with ancillary equipment.

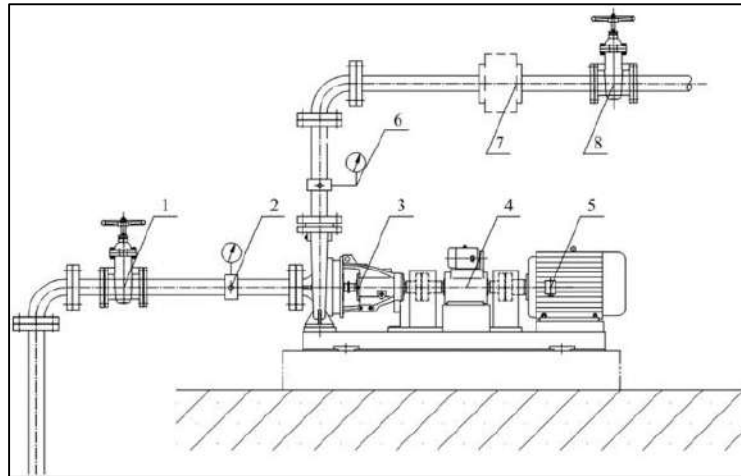


Figure 4: Typical representation of an Oxidation Pump Station

Equipment Required

- Pumps:

The Oxidation pumps shall be of the “non clogging centrifugal pump” type with an 5.5 [kW], IE3, 400 [V] motor complete with baseplate, couplings and guards. A duty/standby pump set is required, featuring key ancillary equipment to ensure optimal performance and reliability.

- Suction Manifold:

The pumps will have one suction manifold, sewage-type diaphragm seal. Each pump will include its own independent RSV-type isolation valve for isolation in maintenance.

- Discharge Manifold:

The discharge pipework for each pump will include its own independent ball-type non-return valve and an RSV-type isolation valve to ensure secure and controlled discharge operations.

A common discharge manifold will be fitted with an accessible pressure gauge, also equipped with a sewage-type diaphragm seal, and supported by a sturdy pipe support for stability and ease of maintenance. This configuration ensures reliable operation, easy monitoring, and efficient handling of sewage.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



To enhance system efficiency and longevity, the pump sets will operate in a flip-flop cycle, alternating their duty and standby roles. This cycling helps distribute the wear and tear evenly between the two pumps, extending their operational lifespan and ensuring continuous availability of at least one functional pump. Both pumps will be driven direct online (DOL).

- Pump Specification:

KSB, KWP-F 50-200 with 400 [V], 3-Phase, 5.5 [kw], 4 Pole, IE3 Motor or similar approved.

Materials of Construction

Pipework and Fittings:	Diameter < 150 [mm]; Carbon Steel according to SANS 62, Medium Duty, Hot Dipped Galvanized (HDG)
Valves:	Cast Iron, Coated
Diaphragm Seal:	Stainless Steel Grade 304
Joint Sets:	Grade 8.8, HDG
Gaskets:	Neoprene or similar approved
Pipe Support:	SJ355R Steel, HDG
Pump Casing:	Mat JL 1040
Pump Impeller:	Mat JL 1040
Shaft and Shaft Sleeve:	Carbon Steel & 316 St Steel
Seal:	Gland Packing
Coupling Type:	HRC
Pump Baseplate:	SJ355R Steel, HDG

Pipework and Ancillary Equipment

Suction Pipework:	100NB, Flanged to SANS 1123 Table 1600/3
Discharge Pipework:	100NB, Flanged to SANS 1123 Table 1600/3
Suction Pressure Gauge:	-150 – 150 [kPa], ½" Process Connection, 100 [mm] Dial
Discharge Pressure Gauge:	0 – 250 [kPa], ½" Process Connection, 100 [mm] Dial
Pipe Support:	≥ 6 [mm] Baseplate & Support; ≥ 3 [mm] Pipe Saddle

Installation

The Oxidation pumps and ancillary equipment shall be mounted to facilitate ease of operation and maintenance.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

MPS02 BIOFILTER RECIRCULATION PUMPS**Scope**

This section of the specification includes the manufacture, delivery, transport, handling, protection, storage, installation, successful commissioning and upholding during the Defects Liability period of the Biofilter Pumps with ancillary equipment.

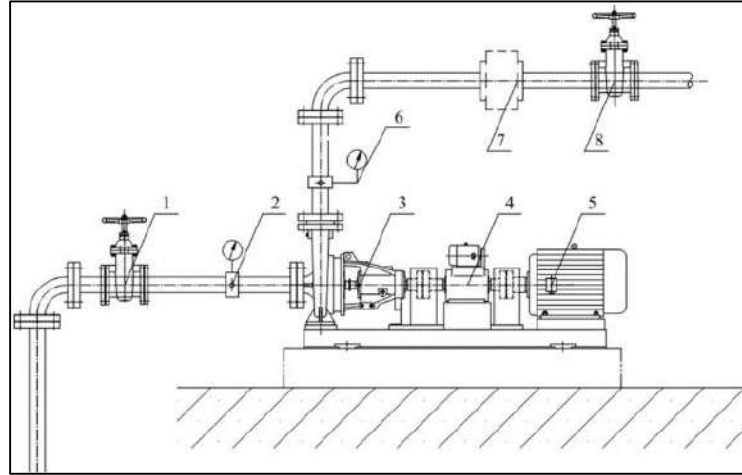


Figure 5: Typical representation of a Biofilter Pump Station

Equipment Required

- Pumps:

The Biofilter pumps shall be of the “non-clogging centrifugal pump” type with a 5.5 [kW], IE3, 400 [V] motor complete with baseplate, couplings and guards. A duty/standby pump set is required, featuring key ancillary equipment to ensure optimal performance and reliability.

- Suction Manifold:

The pumps will have one suction manifold, sewage-type diaphragm seal. Each pump will include its own independent RSV-type isolation valve for isolation in maintenance.

- Discharge Manifold:

The discharge pipework for each pump will include its own independent ball-type non-return valve and an RSV-type isolation valve to ensure secure and controlled discharge operations.

A common discharge manifold will be fitted with an accessible pressure gauge, also equipped with a sewage-type diaphragm seal, and supported by a sturdy pipe support for stability and ease of maintenance. This configuration ensures reliable operation, easy monitoring, and efficient handling of sewage.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



To enhance system efficiency and longevity, the pump sets will operate in a flip-flop cycle, alternating their duty and standby roles. This cycling helps distribute the wear and tear evenly between the two pumps, extending their operational lifespan and ensuring continuous availability of at least one functional pump.

Moreover, both pumps will be driven by Variable Speed Drives (VSDs), providing precise control over pump speed and flow rates. The use of VSDs offers several advantages, including improved energy efficiency, reduced mechanical stress on the pumps during start-up and operation, and the ability to adjust pump performance to match varying process demands. This results in lower operational costs, enhanced reliability, and greater overall efficiency of the pumping system.

- Pump Specification:

KSB, KWP-F 80-250 with a 400 [V], 3-Phase, 5.5 [kW], 4 Pole, IE3 Motor or similar approved.

Materials of Construction

Pipework and Fittings:	Diameter < 150 [mm]; Carbon Steel according to SANS 62, Medium Duty, Hot Dipped Galvanized (HDG)
Valves:	Cast Iron, Coated
Diaphragm Seal:	Stainless Steel Grade 304
Joint Sets:	Grade 8.8, HDG
Gaskets:	Neoprene or similar approved
Pipe Support:	SJ355R Steel, HDG
Pump Casing:	Mat JL 1040
Pump Impeller:	Mat JL 1040
Shaft and Shaft Sleeve:	Carbon Steel & 316 St Steel
Seal:	Gland Packing
Coupling Type:	HRC
Pump Baseplate:	SJ355R Steel, HDG

Pipework and Ancillary Equipment

Suction Pipework:	150NB, Flanged to SANS 1123 Table 1600/3
Discharge Pipework:	150NB, Flanged to SANS 1123 Table 1600/3
Suction Pressure Gauge:	-150 – 150 [kPa], ½" Process Connection, 100 [mm] Dial
Discharge Pressure Gauge:	0 – 250 [kPa], ½" Process Connection, 100 [mm] Dial
Pipe Support:	≥ 6 [mm] Baseplate & Support; ≥ 3 [mm] Pipe Saddle

Installation

The Biofilter pumps and ancillary equipment shall be mounted to facilitate ease of operation and maintenance.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

MPS03 HUMUS SLUDGE RECIRCULATION PUMPS**Scope**

This section of the specification includes the manufacture, delivery, transport, handling, protection, storage, installation, successful commissioning and upholding during the Defects Liability period of the Humus Sludge Recirculation Pumps with ancillary equipment.

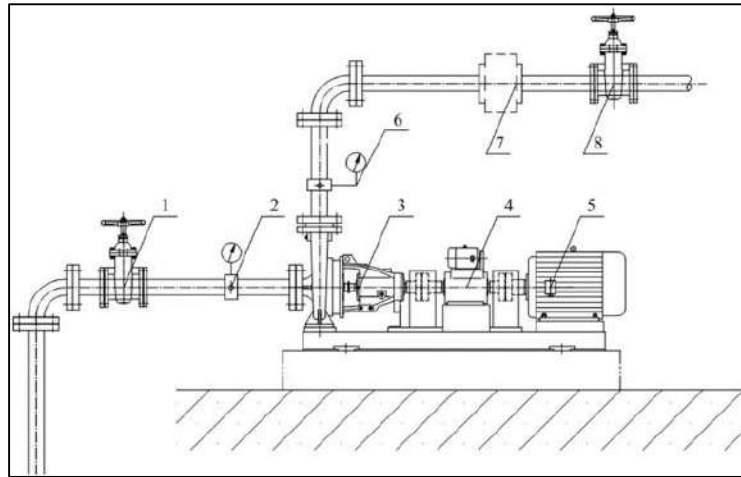


Figure 6: Typical representation of a Humus Sludge Recirculation Pump Station

Equipment Required

- Pumps:

The Humus Sludge Recirculation pumps shall be of the “non clogging centrifugal pump” type with an 5.5 [kW], IE3, 400 [V] motor complete with baseplate, couplings and guards. A duty/standby pump set is required, featuring key ancillary equipment to ensure optimal performance and reliability.

- Suction Manifold:

The pumps will have one suction manifold, sewage-type diaphragm seal. Each pump will include its own independent RSV-type isolation valve for isolation in maintenance.

- Discharge Manifold:

The discharge pipework for each pump will include its own independent ball-type non-return valve and an RSV-type isolation valve to ensure secure and controlled discharge operations.

A common discharge manifold will be fitted with an accessible pressure gauge, also equipped with a sewage-type diaphragm seal, and supported by a sturdy pipe support for stability and ease of maintenance. This configuration ensures reliable operation, easy monitoring, and efficient handling of sewage.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



To enhance system efficiency and longevity, the pump sets will operate in a flip-flop cycle, alternating their duty and standby roles. This cycling helps distribute the wear and tear evenly between the two pumps, extending their operational lifespan and ensuring continuous availability of at least one functional pump.

Moreover, both pumps will be driven by Variable Speed Drives (VSDs), providing precise control over pump speed and flow rates. The use of VSDs offers several advantages, including improved energy efficiency, reduced mechanical stress on the pumps during start-up and operation, and the ability to adjust pump performance to match varying process demands. This results in lower operational costs, enhanced reliability, and greater overall efficiency of the pumping system.

- Pump Specification:

KSB, KWP-F 80-250 with a 400 [V], 3-Phase, 5.5 [kW], 4 Pole, IE3 Motor or similar approved.

Materials of Construction

Pipework and Fittings:	Diameter < 150 [mm]; Carbon Steel according to SANS 62, Medium Duty, Hot Dipped Galvanized (HDG)
Valves:	Cast Iron, Coated
Diaphragm Seal:	Stainless Steel Grade 304
Joint Sets:	Grade 8.8, HDG
Gaskets:	Neoprene or similar approved
Pipe Support:	SJ355R Steel, HDG
Pump Casing:	Mat JL 1040
Pump Impeller:	Mat JL 1040
Shaft and Shaft Sleeve:	Carbon Steel & 316 St Steel
Seal:	Gland Packing
Coupling Type:	HRC
Pump Baseplate:	SJ355R Steel, HDG

Pipework and Ancillary Equipment

Suction Pipework:	150NB, Flanged to SANS 1123 Table 1600/3
Discharge Pipework:	150NB, Flanged to SANS 1123 Table 1600/3
Suction Pressure Gauge:	-150 – 150 [kPa], ½" Process Connection, 100 [mm] Dial
Discharge Pressure Gauge:	0 – 250 [kPa], ½" Process Connection, 100 [mm] Dial
Pipe Support:	≥ 6 [mm] Baseplate & Support; ≥ 3 [mm] Pipe Saddle

Installation

The Humus Sludge Recirculation pumps and ancillary equipment shall be mounted to facilitate ease of operation and maintenance.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

MPS04 HUMUS WASTE SLUDGE PUMPS**Scope**

This section of the specification includes the manufacture, delivery, transport, handling, protection, storage, installation, successful commissioning and upholding during the Defects Liability period of the Humus Waste Sludge Pumps with ancillary equipment.

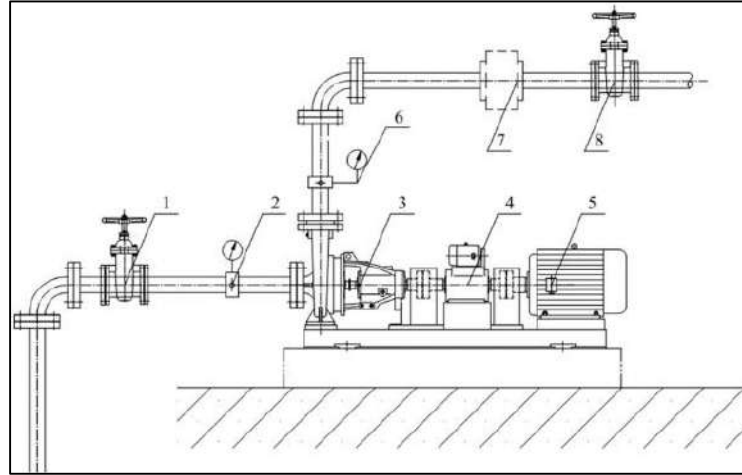


Figure 7: Typical representation of a Humus Waste Sludge Pump Station

Equipment Required

- Pumps:

The Humus Waste Sludge pumps shall be of the “non clogging centrifugal pump” type with an 5.5 [kW], IE3, 400 [V] motor complete with baseplate, couplings and guards. A duty/standby pump set is required, featuring key ancillary equipment to ensure optimal performance and reliability.

- Suction Manifold:

The pumps will have one suction manifold, sewage-type diaphragm seal. Each pump will include its own independent RSV-type isolation valve for isolation in maintenance.

- Discharge Manifold:

The discharge pipework for each pump will include its own independent ball-type non-return valve and an RSV-type isolation valve to ensure secure and controlled discharge operations.

A common discharge manifold will be fitted with an accessible pressure gauge, also equipped with a sewage-type diaphragm seal, and supported by a sturdy pipe support for stability and ease of maintenance. This configuration ensures reliable operation, easy monitoring, and efficient handling of sewage.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



To enhance system efficiency and longevity, the pump sets will operate in a flip-flop cycle, alternating their duty and standby roles. This cycling helps distribute the wear and tear evenly between the two pumps, extending their operational lifespan and ensuring continuous availability of at least one functional pump.

Moreover, both pumps will be driven by Variable Speed Drives (VSDs), providing precise control over pump speed and flow rates. The use of VSDs offers several advantages, including improved energy efficiency, reduced mechanical stress on the pumps during start-up and operation, and the ability to adjust pump performance to match varying process demands. This results in lower operational costs, enhanced reliability, and greater overall efficiency of the pumping system.

- Pump Specification:

KSB, KWP 50-160 with 400 [V], 3-Phase, 5.5 [kW], 4 Pole, IE3 Motor or similar approved.

Materials of Construction

Pipework and Fittings:	Diameter < 150 [mm]; Carbon Steel according to SANS 62, Medium Duty, Hot Dipped Galvanized (HDG)
Valves:	Cast Iron, Coated
Diaphragm Seal:	Stainless Steel Grade 304
Joint Sets:	Grade 8.8, HDG
Gaskets:	Neoprene or similar approved
Pipe Support:	SJ355R Steel, HDG
Pump Casing:	Mat JL 1040
Pump Impeller:	Mat JL 1040
Shaft and Shaft Sleeve:	Carbon Steel & 316 St Steel
Seal:	Gland Packing
Coupling Type:	HRC
Pump Baseplate:	SJ355R Steel, HDG

Pipework and Ancillary Equipment

Suction Pipework:	100NB, Flanged to SANS 1123 Table 1600/3
Discharge Pipework:	100NB, Flanged to SANS 1123 Table 1600/3
Suction Pressure Gauge:	-150 – 150 [kPa], ½" Process Connection, 100 [mm] Dial
Discharge Pressure Gauge:	0 – 250 [kPa], ½" Process Connection, 100 [mm] Dial
Pipe Support:	≥ 6 [mm] Baseplate & Support; ≥ 3 [mm] Pipe Saddle

Installation

The Humus Waste Sludge pumps and ancillary equipment shall be mounted to facilitate ease of operation and maintenance.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**MPS05 AIR SCOUR BLOWERS****Scope**

This specification outlines the requirements for the supply, delivery, installation, testing, commissioning, and defect liability management of one (1) air scour blower for a wastewater treatment facility. The blower shall be a Roots Type, Tri-Lobe (e.g., Robuschi RBS 15/4 or similar approved), designed to provide consistent and efficient air scour to the treatment processes. The installation shall include all associated pipework, valves, supports, and necessary mechanical and electrical components.

Equipment Required

- **Type:**

Roots Type Blower, Tri-Lobe (Robuschi RBS 15/4 or Similar approved).

- **Bearing Life:**

Minimum of 20,000 operating hours.

- **Delivery Pipe Work:**

80NB, PN10, made of Stainless Steel Grade 304.

- **Non-Return Valves:**

150DN PN16 Ball-Type Non-Return valves (AVK or similar approved) to prevent backflow.

- **Pipe Work:**

All pipework shall be flanged and include pipe supports where required to ensure stability and alignment.

- **Drive Mechanism:**

Pulley-driven system to ensure precise control of blower speed and output.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Material of Construction

- **Pipe Work:**

Stainless Steel Grade 304 to ensure durability and corrosion resistance in a wastewater environment.

- **Blower Housing:**

Cast Iron, with an Epoxy Coating for enhanced protection against corrosion and chemical exposure.

- **Fixing Bolts:**

Stainless Steel Grade 304, selected for their strength and corrosion resistance in wet and chemically aggressive environments.

Sizes

- Delivery Pipe Work: 80NB, PN10.
- Non-Return Valves: 150DN, PN16.
- Distribution Arm Size: 200NB to 150NB for effective air distribution.
- Bearing Life Expectancy: 20,000 hours.

Installation

The installation of the air scour blower and associated equipment shall be performed in a manner that ensures optimal operation and maintenance access. The blower shall be securely mounted with all pipework flanged and supported as required. The contractor is responsible for verifying all site dimensions and conditions before installation. The installation shall also include the alignment and tensioning of the pulley-driven system to ensure efficient operation. The system will be tested and commissioned to confirm compliance with performance specifications before handover.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**MPS06 SUMP DRAINAGE PUMPS****Scope**

The sump drainage pump shall be of the Grundfos DP range or something similar that is approved. The pump shall be able to pump circulate spilled water at a rate of 3 [l/s] at a system pressure of 4 [m].

A pump shall be suitable for operation on a 380 V, 50 Hz AC power supply. Protection class: IP68 fitted with a 4 [m] connection cable with plug and float switch. The pump motor shall have self-switching thermal motor monitoring and sheath current cooling.

The pump shall be of the flat suction type with special strainer enabling the fluid to be pumped out to a remaining level of 2 mm. The internal components of the pump shall be manufactured out of non-toxic, rust-free material.

The pump shaft and neck ring shall be made from stainless steel. Pump seals shall be ethylene propylene O-rings. The pump shall be fitted with a union on the supply sides connection to the delivery piping (HDG MS 50 [mm]).

The pump heads given in Schedules 4 - 10 are given for tendering purposes only, and the contractor shall place an order to the supplier of the pump(s) only after he is in receipt of a written document which approves the calculated pump head. The contractor shall calculate the pump head and submit the calculations for approval to the Consulting Engineer.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

MPS07 DISINFECTION**MPS07.1 Sodium Hypochlorite Dosing System****Scope**

This section of the specification includes the manufacture, delivery, transport, handling, protection, storage, installation, successful commissioning and upholding during the Defect Liability Period of a Sodium Hypochlorite Dosing System that will be used to disinfect the final effluent for the removal of bacteria, viruses, and other pathogens.

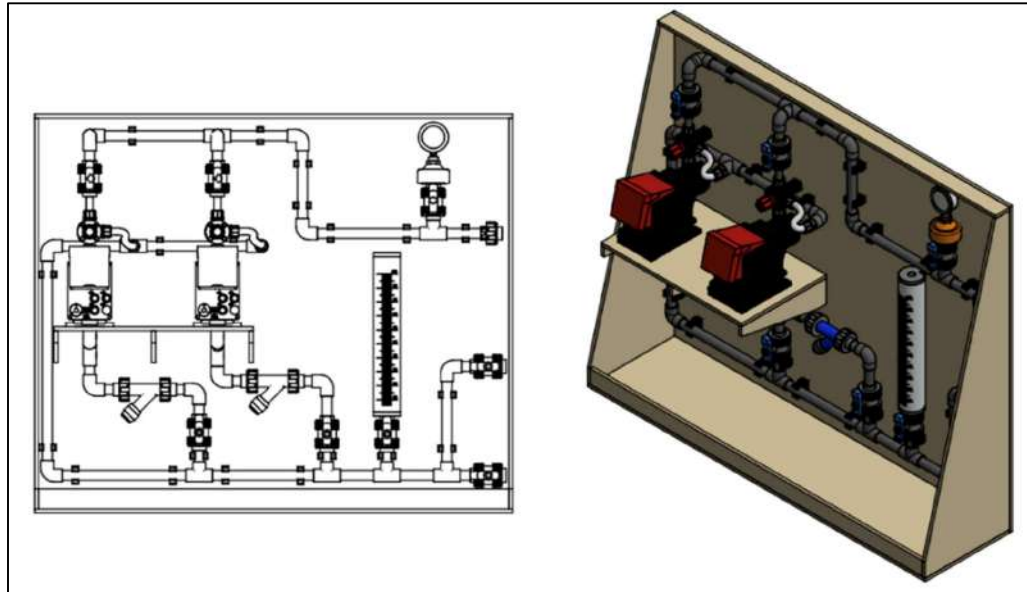


Figure 8: Schematic of a typical chemical dosing skid.

Equipment Required

A duty/standby-operated dosing skid is required to inject sodium hypochlorite at a concentration of 12.5 [%] into the inlet of the contact channels through an injector. The system will feature an open bunded design for spill containment, constructed with 10 [mm] thick polypropylene to ensure durability and chemical resistance. The skid will include 2 x 250 [L] storage tanks designed to handle chemicals with a specific gravity of 1.6.

The dosing skid will be equipped with essential components to ensure efficient and safe operation. This includes a strainer on the inlet line to prevent debris from entering the system, thereby protecting the pumps and other downstream equipment. Each dosing pump, configured in a duty/standby arrangement, will have a pressure loading and relief valve to manage pressure and provide back pressure relief.

Additionally, a calibration tube will be included for precise dosing, and a pressure gauge with a chemical seal will monitor system pressure, ensuring accurate and reliable operation.

To support the entire assembly, the dosing skid will be mounted on a robust mild steel stand, which will be powder-coated to enhance its durability and resistance to corrosion. PVC piping will be routed from the chemical dosing skid to the dosing point, ensuring a

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



secure and efficient transfer of the sodium hypochlorite. The dosing skid will be housed in a refurbished building in close proximity to the contact channels, with the storage tank placed next to the building on a concrete plinth, providing stability and easy access.

Additionally, a filling line will be required for the storage tank, facilitating refills when necessary. This comprehensive design, with its focus on safety, precision, and durability, will ensure the effective injection of sodium hypochlorite into the contact channels, maintaining optimal processes.

The system should also include an automatic dosing feature, which adjusts the sodium hypochlorite injection rate based on the measured final effluent flow rate. This ensures that the dosing is proportional to the flow, optimising chemical usage and maintaining consistent disinfection levels regardless of variations in wastewater flow. The benefits of this automatic dosing system include improved operational efficiency, reduced chemical waste, and enhanced process control, leading to more stable and compliant effluent quality. By adapting to real-time flow conditions, the system ensures reliable and cost-effective water treatment.

Material of Construction

Storage Tank:	Chemical Heavy, SG = 1.6
Dosing Skid:	Polypropylene
Dosing Pumps:	PVC
Pipework:	PVC
Dosing Skid Frame:	SJ355R Steel, Powder coated (Black)
Injector:	PVC

Sizes

Dosing Rate, Free Available Chlorine = 5 – 8 [ppm]

- Use 12.5 [%] m/v available chlorine in a sodium hypochlorite solution
- Use density = 1200 [kg/m³] for a Sodium Hypochlorite solution

Thus, Dosing Rate = 0 – 6 [l/h]

Storage Tanks:	2 500 [L] Circular Vertical Tank
Dosing Pumps:	Max. Dosing Rate – 6 [l/h] @ 1 [bar]
Dosing Skid:	To suit building layout; width/height < 2 [m]
Pipework:	25 [mm], Class 12

Note: The dosing rate should be set to dose-proportional according to the measured final effluent flow rate.

Installation

The sodium hypochlorite system and ancillary equipment shall be mounted to facilitate ease of operation and maintenance.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



MPS07.2 Overflow Weir with Ultrasonic Flow Meter

Scope

This section of the specification includes the manufacture, delivery, transport, handling, protection, storage, installation, successful commissioning and upholding during the Defects Liability period of an Overflow Weir with an Ultrasonic Flow Sensor installed at the end of the contact channels.

Equipment Required

Several key pieces of equipment are required to install the overflow weir with an ultrasonic flow sensor at the outlet of the contact channels. The overflow weir, constructed from durable materials such as stainless steel, must be properly sized and shaped to suit the specific flow conditions and measurement requirements.

An ultrasonic flow sensor featuring a non-contact ultrasonic level sensor will measure the water level over the weir. This sensor should be housed in corrosion-resistant materials to withstand the harsh environment of a wastewater treatment plant. It will need to be securely mounted above the weir using a bracket and hardware made of similarly resistant materials.

Shielded cables will transmit signals from the sensor to the control system to ensure reliable operation, while a dedicated power supply unit will provide consistent power. An interface module will facilitate integration with the plant's control system, allowing for real-time monitoring of flow rates.

The ultrasonic flow sensor's real-time measurement will be used to control the sodium hypochlorite dosing. It must include a controller to convert 4-20 [mA] signals to flow rate measurements and feature data-logging capabilities. The flow meter and controller should be weatherproof with an IP66 protection rating.

Material of Construction

All components and fixing anchors directly related to the overflow weir shall be fabricated from stainless steel grade 304 to ensure durability and resistance to corrosion in a wastewater environment.

Weir:	Stainless Steel 304
Anchors:	Stainless Steel 304
Sensor Bracket:	Stainless Steel 304
Sensor:	Polypropylene or similar approved
Controller:	ABS or similar approved

Size

Channel Dimensions:

Height: 2000 [mm]
Width: 1000 [mm]

Ultrasonic Flow Meter:

Sensor Bracket Thickness: 3 [mm]

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Length: 1000 [mm]
Width: to suit the sensor plus 10 [mm] overhang on each side

Installation

The flow meter controller shall be mounted to facilitate easy operation and maintenance. The weir shall be installed, and the cavities shall be filled with non-shrink grout or epoxy to create a watertight seal around the flume.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



C3.4.3: ELECTRICAL PROJECT SPECIFICATIONS

ELECTRICAL TEST SPECIFICATION

ELECTRICAL SCOPE

This section of the contract covers the related design, supply, delivery, installation, putting into satisfactory operation, testing and maintenance during the defects liability period of the electrical installation for the works consisting of new Motor Control Centres (MCC), cables and all electrical, control and instrumentation equipment necessary to complete the installation of **Vrede / Thembalihle Wastewater Treatment Works (WWTW)** in full working order. Electric motors must be provided as part of the relevant driven equipment in the Mechanical Project Specification of this document.

All equipment and work carried out must be in accordance with the particular specification unless stated otherwise in this project specification. Particular attention must be paid to specific clauses stipulated in the following paragraphs.

Control parameter settings given are provisional, and it will be the Contractor's responsibility to verify and adjust these settings in accordance with the site and system specific conditions, to be verified with the Engineer prior to and during commissioning. Provision must be made in the price for monitoring of parameters and adjustment to optimise the system operation and ensure operation as per the intent of the specification.

These sections must be read in conjunction with the associated mechanical and civil sections to form a holistic picture and understanding of the Employer's requirements.

Note that the final offer, under this section, must be fully aligned in terms of scope with the final mechanical and process designs and offers.

The scope of works comprises in short:

- Supply, delivery, installation, termination, testing, and commissioning of a new 100 [kVa] Transformer, including poles, cross arms, insulators, fuse cutouts, Lighting arrestors, grounding materials, hardware, cable for secondary connection, main breaker and panel, and earthing.
- Supply, delivery, installation, termination, testing and commissioning of a new 110 [kVa] generator.
- Design, Supply, delivery, installation, termination, testing, and commissioning of the New Main Motor Control Centre (MCC), Inlet Works (MCC), and Disinfection (MCC), which will include switchgear assembly, complete with starters and associated controls to supply all the equipment on the wastewater treatment plant.
- Supply, delivery, installation, termination and testing of low voltage and control cables, including cable ladders. **Excavation and backfilling of trenches will form part of the civil scope of works.**
- Supply, delivery, installation, testing and commissioning of various instrument types.
- Earthing of equipment supplied as part of this contract.
- Provide operating, maintenance and "as-built" documentation.
- Provide personnel training.

The broad scope listed above, with functional Employer's requirements detailed in the following section, provides the project and costing framework for the Contractor to provide a fully priced and compliant offer, making provision for final Contractor designs and overall successful and compliant project and system implementation.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



ELECTRICAL SUPPLY AND EARTH CONNECTION

The supply to the **Vrede / Thembalihle WWTW** will be 3-phase 400 [V] / 230 [V] nominal, at 50 [Hz] from the new 100 [kVa] Transformer situated within the plants' perimeter and approximately 400 [m] from the main MCC Pump Station building.

The point of supply for all the electrical equipment on the **Vrede / Thembalihle WWTW** will be from the main MCC situated within the Pump Station building.

The point of supply for the local distribution boards will be from the Main MCC, Inlet MCC, and the Disinfection MCC, which will supply power to the pump station building, the control room building, and the disinfecting building.

The provisional cable sizes and lengths are given in the price and cable schedule for the purpose of tendering. The size for orders must be confirmed with the Engineer, and the length must be determined on-site and be a rememberable item.

The contractor will be responsible for promptly making the necessary arrangements for the electrical connection with the plant operations manager. Once connected, the contractor must ensure that the supply, i.e. voltage and earthing, are in order before switching power onto his equipment. Claims for damage arising from noncompliance will not be accepted.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**EPS01 TRANSFORMER****EPS01.1 General Information**

- Supply and Installation of 100 [kVa] Pole-Mounted Transformer

EPS01.2 Scope of Work

- Supply, delivery, installation, testing, and commissioning of one (1) 100 [kVa] pole-mounted transformer and all necessary accessories.
- Dismantling and safe disposal of the existing transformer, if applicable.
- Provision and installation of poles, cross-arms, insulators, and other necessary hardware.

EPS01.3 Technical Specifications**EPS01.3.1 Transformer Specifications**

- Rating: 100 [kVa]
- Primary Voltage: 11 [kV]
- Secondary Voltage: 400 [V]/230 [V]
- Frequency: 50 [Hz]
- Cooling Type: Oil-Immersed, ONAN (Oil Natural Air Natural)
- Vector Group: Dyn11
- Impedance: 4 [%]
- Winding Material: Copper
- Tapping Range: ± 5 [%] in 2.5 [%] steps
- Insulation Level: LI 75/AC 28 for primary, AC 3 for secondary

EPS01.3.2 Construction Features

- Core: High-grade, cold-rolled, grain-oriented silicon steel.
- Tank: Robust construction with corrugated or radiators for cooling.
- Bushings: Porcelain bushings for HV and LV sides.
- Oil Type: Mineral oil as per IS: 335 / IEC 60296 / SANS 555
- Protection: Buchholz relay, pressure relief device, oil level indicator, temperature indicator.

EPS01.3.3 Performance Requirements

- Efficiency: Minimum 98 [%] at full load.
- No-Load Losses: ≤ 1 [kW]
- Load Losses: ≤ 3.5 [kW]
- Temperature Rise: Maximum 55 [°C] in oil and 60 [°C] in winding.

EPS01.3.4 Standards Compliance

- Design and Testing: SANS 780 / IEC 60076
- Installation: NRS 029

EPS01.3.5 Accessories and Hardware

- Poles: Wooden or steel poles as per SANS 10313.
- Crossarms: Galvanized steel crossarms.
- Insulators: Pin-type or post-type porcelain insulators.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- Earthing: Complete earthing system compliant with SANS 10292.
- Fuses: Drop-out fuses or other protection devices.
- Lightning Arresters: High-voltage surge arresters as per SANS 60099-4.

EPS01.3.6 Testing and Inspection

- Factory acceptance tests (FAT) as per relevant standards.
- Routine and type tests as per SANS / IEC standards.
- On-site testing after installation, including insulation resistance, transformer turns ratio, and vector group test.

EPS01.3.7 Installation Requirements

- Detailed site survey before installation.
- Provision of all necessary tools and equipment.
- Compliance with safety and regulatory standards.
- Coordination with local utility for power shutdowns, if required.

EPS01.3.8 Regulatory and Safety Requirements

- Compliance with the Occupational Health and Safety Act (OHSA) of South Africa.
- Environmental compliance as per the National Environmental Management Act (NEMA).
- All electrical installations to comply with SANS 10142-1 (Wiring of Premises).

EPS01.3.9 Warranty and Maintenance

- Warranty Period: Minimum two years from the date of commissioning.
- Maintenance Support: Provide details of after-sales service and maintenance support.

EPS01.3.10 Documentation

- Detailed drawings and technical data sheets.
- Operation and maintenance manuals.
- Test certificates and warranty documents.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**EPS02 MAIN MOTOR CONTROL CENTRE (MCC)****EPS02.1 Introduction**

This section outlines the technical specifications and requirements for the design, supply, installation, and commissioning of a new Main Motor Control Centre (MCC) at the Vrede / Thembalihle Wastewater Treatment Works (WWTW). The MCC will distribute power to the Inlet MCC, Disinfection MCC and to all equipment within the WWTW, ensuring reliable and efficient operation in compliance with South African regulations.

EPS02.2 Scope of Work

The scope of work includes but is not limited to the following:

- Design of the Main MCC, Inlet MCC and Disinfection MCC
- Supply of MCC's components
- Installation of the MCC
- Testing and commissioning
- Training of operational personnel

EPS02.3 Technical Specifications**EPS02.3.1 General Requirements**

- The MCCs shall be designed and manufactured in accordance with the latest South African Bureau of Standards (SABS) and International Electrotechnical Commission (IEC) standards.
- The MCCs shall comply with the Occupational Health and Safety Act (OHSA) regulations.
- The MCCs shall be suitable for operation in an industrial environment with ambient temperatures ranging from -10 [°C] to 40 [°C] and non-condensing humidity up to 95 [%].

EPS02.3.2 MCC's Construction

- The MCCs shall be of modular design, allowing for future expansion.
- The enclosure shall be robust, dust-tight, and weatherproof construction (IP54 minimum).
- The MCCs shall have a Form 4 Type 2 internal separation.
- Busbar rating shall be 400 [A] with a short circuit rating of 50 [kA] for 1 second.

EPS02.3.3 Electrical Components

- Incoming feeder: 400 [V], 3-phase, 50 [Hz], with a main circuit breaker with adjustable thermal and magnetic trip units.
- Make allowance for ATS from Generator
- Outgoing feeders shall include appropriate protection devices for each type of load (DOL starters, VSDs, and soft starters).
- All starters shall be equipped with local and remote control options.

EPS02.3.4 Control and Instrumentation

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- The Main MCC shall be equipped with a programmable logic controller (PLC) to control and monitor all connected equipment.
- Human Machine Interface (HMI) for operator interaction.
- Communication protocols: Modbus TCP/IP and Profibus DP.
- Integration of SCADA system for remote monitoring and control.

EPS02.3.5 Equipment Controlled by Main MCC

- Power Supply to Inlet Works MCC
- Power Supply to Disinfection MCC
- Clarifier Bridge No.1(DOL)
- Clarifier Bridge No.2 (DOL)
- Irrigation Pump No.1 (Soft Starter)
- Irrigation Pump No.2 (Soft Starter)
- Oxidation Pump No.1 (DOL)
- Oxidation Pump No.2 (DOL)
- Biofilter Pump No.1 (VSD)
- Biofilter Pump No.2 (VSD)
- Humus Sludge Recirculation Pump No.1 (VSD)
- Humus Sludge Recirculation Pump No.2 (VSD)
- Humus Waste Sludge Pump No.1 (VSD)
- Humus Waste Sludge Pump No.2 (VSD)
- Air Scour Blower No.1 (DOL)
- Air Scour Blower No.2 (DOL)
- Sump Drainage Pump (DOL)
- Local Distribution Board No.1

EPS02.3.6 Equipment Controlled by Inlet Works MCC

- Screw Screen (DOL with Forward and Reverse Functions)
- Inlet Channel: Ultrasonic Flow Meter
- Local Distribution Board No.2

EPS02.3.7 Equipment Controlled by Disinfection MCC

- Dosing Pump No.1 (DOL with 4-20mA)
- Dosing Pump No.2 (DOL with 4-20mA)
- Contact Channel: Ultrasonic Flow Meter
- Local Distribution Board No.3

EPS02.3.8 Testing and Commissioning

- Comprehensive factory acceptance tests (FAT) and site acceptance tests (SAT) shall be conducted.
- All tests shall be documented, and results submitted for approval.
- Commissioning will include functional testing of all equipment and integration with the existing WWTW systems.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**EPS02.4 Documentation and Training**

- Detailed design drawings, single-line diagrams, and schematics to be provided.
- Operation and maintenance manuals for all equipment.
- Training for WWTW operational and maintenance staff on MCC's operation and troubleshooting.

EPS02.5 Warranty

- The MCCs and all associated equipment shall have a minimum warranty period of 12 months from the date of commissioning.

EPS02.6 Compliance and Safety

- The contractor must ensure compliance with all relevant South African regulations and standards.
- The MCCs shall include all necessary safety features and emergency stops as per OHSA requirements.
- Delivery time and project schedule

By adhering to the above specifications, the new MCCs at the Vrede / Thembalihle WWTW will ensure efficient and reliable operation of all equipment within the facility, in full compliance with South African regulations.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**EPS03 ULTRASONIC FLOW METER****EPS03.1 Introduction**

Supply, installation, and commissioning of an open-channel ultrasonic flow meter. This specification outlines the requirements for the flow meter to ensure compliance with South African regulations and the operational needs of the Vrede / Thembaahlhle WWTW.

EPS03.2 Scope of Work

The scope includes the following:

- Supply of an open channel ultrasonic flow meter, one at inlet works and one at effluent outflow
- Installation at the inlet works and effluent outflow
- Commissioning and calibration of the flow meter
- Training of personnel on operation and maintenance
- Provision of technical documentation and support

EPS03.3 Technical Specifications**EPS03.3.1 Flow Meter Type**

- Type: Ultrasonic flow meter suitable for open channel applications
- Measurement Principle: Non-contact, transit-time ultrasonic measurement
- Channel Width: Suitable for channels up to 2 [m] wide

EPS03.3.2 Measurement Range

- Flow Rate: 0.1 to 5,000 [l/s]
- Accuracy: ± 1 [%] of reading or better
- Resolution: 0.1 [l/s]

EPS03.3.3 Environmental Conditions

- Operating Temperature: -20 [°C] to +60 [°C]
- Ingress Protection: IP68 or equivalent for sensor and transmitter

EPS03.3.4. Power Supply

- Power Source: 220-240V AC, 50Hz or solar power with battery backup
- Power Consumption: < 20W

EPS03.3.5. Output and Communication

- Output Signal: 4-20 [mA], HART, Modbus, or equivalent
- Data Logging: Built-in data logger with at least 1-year storage capacity
- Display: Integrated display showing real-time flow rate, totalised flow, and status messages

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**EPS03.3.6. Construction Materials**

- Sensor Material: Corrosion-resistant materials suitable for wastewater environments
- Transmitter Enclosure: Stainless steel or equivalent durable material

EPS03.4 Installation and Commissioning**EPS03.4.1 Site Preparation**

- Contractor shall survey the installation site and prepare it as per the requirements of the flow meter.

EPS03.4.2. Installation

- Installation shall be carried out by qualified personnel.
- All installation work shall comply with local and national safety regulations.

EPS03.4.3. Calibration

- The flow meter shall be calibrated on-site using standard methods and equipment.
- A calibration certificate shall be provided.

EPS03.4.4 Commissioning

- Commissioning shall include testing the flow meter under actual operating conditions to ensure accurate performance.
- A commissioning report shall be provided.

EPS03.5 Training and Documentation**EPS03.5.1 Training**

- The contractor shall provide comprehensive training to Vrede / Thembalihle WWTW personnel on the operation and maintenance of the flow meter.

EPS03.5.2 Documentation

- Detailed user manuals, technical specifications, wiring diagrams, and maintenance schedules shall be provided.

EPS03.6 Compliance and Standards**EPS03.6.1 Regulatory Compliance**

- The flow meter must comply with the South African National Standards (SANS) relevant to wastewater flow measurement and instrumentation.
- Compliance with the National Water Act and Department of Water and Sanitation guidelines.

EPS03.6.2 Quality Standards

- ISO 9001:2015 for quality management systems
- ISO 14001:2015 for environmental management systems

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**EPSO3.7 Warranty and Support****EPSO3.7.1 Warranty**

- The flow meter shall have a minimum warranty of 2 years from the date of commissioning.

EPS04 OXIDATION PUMPS

- The Oxidation pumps should operate in a duty and standby configuration, with a pressure transmitter on the common discharge manifold for dry-run protection.
- The Oxidation pumps shall be of the “non-clogging centrifugal pump” type with a 5.5 [kW], IE3, 400 [V] motor.
- Controlled by DOL (5.5 [kW])
- The pumps must be operated both automatically and manually. Each pump has a three-position selector switch on the MCC labelled AUTO/OFF/MANUAL. A pump cannot be started in the OFF position, and a running pump must STOP when switched to OFF.
- **In Manual mode:** The pumps must be started and stopped utilizing START and STOP pushbuttons for each pump on the MCC.

1. **Automatic Mode:** The duty pump should start when the selector switch is in AUTO. A delayed timer connected to the pressure transmitter monitors the discharge pressure. If the pressure falls below a certain set point, the pump will be stopped, and an alarm will be activated. The main MCC powers the no-flow pressure transmitter and timer.

- **Set Point:** The required flow rate of the Oxidation pumps will be determined by commissioning the WWTW.
- **Duty select:** A three-position selector switch labelled PUMP DUTY SELECT must be provided, with the switch positions marked ALTERNATE/P1/P2.

In the ALTERNATE position, the duty pumps must automatically change over after every pumping cycle (i.e., if P1 were running, P2 would run next, P1 again, and so forth). The standby pump must take over if a duty pump is switched off, fails to start, or fails when running. Should the failed pump be reset, it must not restart (i.e., the running pump must complete the pumping cycle) but be available as standby. In position P1 or P2, the operation must be exactly as for ALTERNATE, except the selected duty pump must always START first (i.e. no cycle changeover).

- **Protection:** All control modes must protect each pump set against damage due to the conditions described below. The motor must STOP, and a corresponding fault indication light must be switched ON. Unless specified otherwise, protection devices must have manual resets. The motor may only restart once the protection device has been reset.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



EPS05 BIOFILTER PUMPS

- The Biofilter pumps should operate in a duty and standby configuration, with a pressure transmitter on the common discharge manifold for dry-run protection.
- The Biofilter pumps shall be of the “non-clogging centrifugal pump” type with a 5.5 [kW], IE3, 400 [V] motor.
- Controlled by VSD (5.5 [kW])
- The pumps must be operated both automatically and manually. Each pump has a three-position selector switch on the MCC labelled AUTO/OFF/MANUAL. A pump cannot be started in the OFF position, and a running pump must STOP when switched to OFF.
- **In Manual mode:** The pumps must be started and stopped utilizing START and STOP pushbuttons for each pump on the MCC.
- **Automatic Mode:** The duty pump should start when the selector switch is in AUTO. A delayed timer connected to the pressure transmitter monitors the discharge pressure. If the pressure falls below a certain set point, the pump will be stopped, and an alarm will be activated. The main MCC powers the no-flow pressure transmitter and timer.
- **Set Point:** The required flow rate of the biofilter pumps will be determined by commissioning the WWTW.
- **Duty select:** A three-position selector switch labelled PUMP DUTY SELECT must be provided, with the switch positions marked ALTERNATE/P1/P2.
- In the ALTERNATE position, the duty pumps must automatically change over after every pumping cycle (i.e., if P1 were running, P2 would run next, P1 again, and so forth). The standby pump must take over if a duty pump is switched off, fails to start, or fails when running. Should the failed pump be reset, it must not restart (i.e., the running pump must complete the pumping cycle) but be available as standby. In position P1 or P2, the operation must be exactly as for ALTERNATE, except the selected duty pump must always START first (i.e. no cycle changeover).
- **Protection:** All control modes must protect each pump set against damage due to the conditions described below. The motor must STOP, and a corresponding fault indication light must be switched ON. Unless specified otherwise, protection devices must have manual resets. The motor may only restart once the protection device has been reset.

EPS06 HUMUS SLUDGE RECIRCULATION PUMPS

- The Humus Sludge Recirculation pumps should operate in a duty and standby configuration, with a pressure transmitter on the common discharge manifold for dry-run protection.
- The Humus Sludge Recirculation pumps shall be of the “non-clogging centrifugal pump” type with a 5.5 [kW], IE3, 400 [V] motor.
- Controlled by VSD (5.5 [kW])
- The pumps must be operated both automatically and manually. Each pump has a three-position selector switch on the MCC labelled AUTO/OFF/MANUAL. A pump cannot be started in the OFF position, and a running pump must STOP when switched to OFF.
- **In Manual mode:** The pumps must be started and stopped utilizing START and STOP pushbuttons for each pump on the MCC.
- **Automatic Mode:** The duty pump should start when the selector switch is in AUTO. A delayed timer connected to the pressure transmitter monitors the discharge pressure. If the pressure falls below a certain set point, the pump will be stopped, and an alarm will be activated. The main MCC powers the no-flow pressure transmitter and timer.
- **Set Point:** The required flow rate of the Humus Sludge Recirculation pumps will be determined by commissioning the WWTW.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



- **Duty select:** A three-position selector switch labelled PUMP DUTY SELECT must be provided, with the switch positions marked ALTERNATE/P1/P2.
- In the ALTERNATE position, the duty pumps must automatically change over after every pumping cycle (i.e., if P1 were running, P2 would run next, P1 again, and so forth). The standby pump must take over if a duty pump is switched off, fails to start, or fails when running. Should the failed pump be reset, it must not restart (i.e., the running pump must complete the pumping cycle) but be available as standby. In position P1 or P2, the operation must be exactly as for ALTERNATE, except the selected duty pump must always START first (i.e. no cycle changeover).
- **Protection:** All control modes must protect each pump set against damage due to the conditions described below. The motor must STOP, and a corresponding fault indication light must be switched ON. Unless specified otherwise, protection devices must have manual resets. The motor may only restart once the protection device has been reset.

EPS07**HUMUS WASTE SLUDGE PUMPS**

- The Humus Waste Sludge pumps should operate in a duty and standby configuration, with a pressure transmitter on the common discharge manifold for dry-run protection.
- The Humus Waste Sludge pumps shall be of the “non-clogging centrifugal pump” type with a 5.5 [kW], IE3, 400 [V] motor.
- Controlled by VSD (5.5 [kW])
- The pumps must be operated both automatically and manually. Each pump has a three-position selector switch on the MCC labelled AUTO/OFF/MANUAL. A pump cannot be started in the OFF position, and a running pump must STOP when switched to OFF.
- **In Manual mode:** The pumps must be started and stopped utilizing START and STOP pushbuttons for each pump on the MCC.
- **Automatic Mode:** The duty pump should start when the selector switch is in AUTO. A delayed timer connected to the pressure transmitter monitors the discharge pressure. If the pressure falls below a certain set point, the pump will be stopped, and an alarm will be activated. The main MCC powers the no-flow pressure transmitter and timer.
- **Set Point:** The required flow rate of the Humus Waste Sludge pumps will be determined by commissioning the WWTW.
- **Duty select:** A three-position selector switch labelled PUMP DUTY SELECT must be provided, with the switch positions marked ALTERNATE/P1/P2.
- In the ALTERNATE position, the duty pumps must automatically change over after every pumping cycle (i.e., if P1 were running, P2 would run next, P1 again, and so forth). The standby pump must take over if a duty pump is switched off, fails to start, or fails when running. Should the failed pump be reset, it must not restart (i.e., the running pump must complete the pumping cycle) but be available as standby. In position P1 or P2, the operation must be exactly as for ALTERNATE, except the selected duty pump must always START first (i.e. no cycle changeover).
- **Protection:** All control modes must protect each pump set against damage due to the conditions described below. The motor must STOP, and a corresponding fault indication light must be switched ON. Unless specified otherwise, protection devices must have manual resets. The motor may only restart once the protection device has been reset.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**EPS08 AIR SCOUR BLOWERS**

- The air scour blowers shall operate in a duty and standby configuration, ensuring continuous operation even in the event of a failure.
- The blowers shall be of the roots rotary lobe type with a 5.5 [kW], IE3, 400 [V] motor designed for reliable performance.
- Controlled by DOL (5.5 [kW])
- The blowers must be capable of both automatic and manual operation. Each blower is equipped with a three-position selector switch on the Motor Control Center (MCC) labelled AUTO/OFF/MANUAL. A blower cannot be started when in the OFF position, and any running blower must STOP when switched to OFF.
- In **Manual Mode**: The blowers shall be started and stopped using START and STOP pushbuttons for each blower located on the MCC.
- In **Automatic Mode**: The duty blower shall start when the selector switch is set to AUTO. Control logic shall manage the blower's starting and stopping based on operational requirements and system demand.
- **Set Point**: The required airflow rate for the air scour blowers will be determined during the system's commissioning.
- **Duty Select**: A three-position selector switch labelled BLOWER DUTY SELECT shall be provided, with switch positions marked ALTERNATE/B1/B2.

In the ALTERNATE position, the duty blowers shall automatically alternate after each operating cycle (i.e., if B1 was running, B2 shall run next, followed by B1, and so forth). The standby blower must take over if the duty blower is switched off, fails to start, or fails during operation. If the failed blower is reset, it shall not restart (i.e., the running blower must complete the current cycle) but shall be available as a standby. In positions B1 or B2, operation shall be the same as for ALTERNATE, except the selected duty blower shall always START first, without cycle changeover.

- **Protection**: All control modes shall protect each blower set from damage due to adverse conditions. The motor shall STOP, and a corresponding fault indication light shall illuminate. Unless otherwise specified, protection devices shall have manual resets. The motor may only restart once the protection device has been reset.

EPS09 SUMP DRAINAGE PUMP**EPS09.1 Objective**

Ensure reliable and efficient operation of the sump drain pump via control from the Main Motor Control Centre (MCC) to manage water levels and prevent overflow in the Main Pump Station. The Sump Drainage pump shall be of the "Submersible pump" type with a 2.2 [kW], IE3, 400 [V] motor.

EPS09.2 Control Scheme

- **Control Location**: Main MCC.
- **Pump Operation**: Controlled by a combination of level probes, control relays, and circuit breakers within the MCC.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**EPS09.3 Operational Modes****Normal Operation:**

- **Low Water Level:** Pump is off. Control relay de-energizes.
- **Intermediate Water Level:** Pump is activated. Control relay energizes, starting the pump.
- **High Water Level:** Pump operates continuously. Control relay remains energized until water level decreases.

Manual Override:

- **Manual Start/Stop:** Pump can be manually controlled via MCC push buttons or switches for maintenance or emergency purposes.

EPS09.4 Safety Features

- **High Water Level Alarm:** Activates an alarm if the water level exceeds a critical threshold, signalling the need for immediate attention.
- **Pump Protection:** Includes motor protection circuit breakers and thermal overload protection to prevent damage.

EPS10 DISINFECTION**EPS10.1 Sodium Hypochlorite Dosing System**

- The system is equipped with two sodium hypochlorite dosing pumps pumping from 2 x 2500 [L] chemical storage tanks.
- The dosing pumps must operate on one duty and standby configuration and must work on flow control (proportional dosing) derived from the ultrasonic flow meter described below.
- The dosing pumps shall be of the “digital dosing pump” type with an integrated flow meter and control to enable accurate proportional dosing. (Grundfos DDE 6-10 or similar approved)
- DOL Starter (0.19 [kW])
- The pumps must be operated both automatically and manually. Each pump has a three-position selector switch on the MCC labelled AUTO/OFF/MANUAL. In the OFF position, a pump cannot be started, and a running pump must STOP when switched to OFF.
- **In Manual mode:** The pumps must be started and stopped utilizing START and STOP pushbuttons for each pump on the MCC.
- **Automatic mode:** Flow Control, the duty pump must START when the Final effluent ultrasonic flow meter detects a flow and STOP once the flow has dropped to zero. The flow signals are derived from an ultrasonic flow meter in the final effluent channel.
- **Proportional dosing:** The required dosing rate (mg/l) setpoint of the sodium hypochlorite solution must be adjustable on the operator interface of each digital dosing pump. An analogue flow measurement, derived from the ultrasonic flow meter at the final effluent overflow weir, shall be used to establish the flow rate (l/s) so that the digital dosing pump can dose sodium hypochlorite proportional to the outflow.
- **Duty select:** A three-position selector switch labelled PUMP DUTY SELECT must be provided, with the switch positions marked ALTERNATE/P1/P2.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



In the ALTERNATE position, the duty pumps must automatically change over after every pumping cycle (i.e., if P1 were running, P2 would run next, P1 again, and so forth). Should a duty pump be switched off, fail to start, or fail when running, the standby pump must take over. Should the failed pump be reset, it must not restart (i.e., the running pump must complete the pumping cycle) but be available as standby. In position P1, or P2, the operation must be exactly as for ALTERNATE, except, the selected duty pump must always START first (i.e. no cycle changeover).

- **Protection:** All control modes must protect each pump set against damage due to the conditions described below. The motor must STOP, and a corresponding fault indication light must be switched ON.

Unless specified otherwise, protection devices must have manual resets. The motor may only restart once the protection device has been reset.

EPS11 LOCAL POWER

EPS11.1 Scope of Work

This specification outlines the requirements for three (3) Buildings to be equipped with new electrical installation in:

- Pump Station Building: 10 x 15 [m]
- Control Room Building: 7 x 10 [m]
- Disinfection Building: 5 x 5 [m]

The installation includes a local distribution board, internal and external lighting, power outlets, and all necessary conduits and wiring to complete the three (3) buildings.

EPS11.2 Standards and Regulations

All work must comply with the following:

- South African National Standards (SANS) 10142-1: The Wiring of Premises
- Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)
- Local municipal regulations and bylaws

EPS11.3 Local Distribution Boards

- Distribution Board (DB):
- One (1) local distribution board installed inside each building.
- The DB should have a lockable enclosure for safety.
- Must include a main switch, circuit breakers for lighting and power outlets, and a residual current device (RCD).

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**EPS11.4 Lighting Requirements**

Internal Lighting:

- Two (2) ceiling-mounted lights.
- Lights should be energy-efficient LED type.
- Each light is to be controlled by a separate switch.

External Lighting:

- Two (2) LED floodlights for outside the building.
- Weatherproof and rated for outdoor use (IP65 or higher).
- Controlled by a single switch located inside the building near the entrance.

EPS11.5 Power Outlets

- Two (2) double power outlets installed inside the building.
- Outlets to be mounted at a standard height of 450 [mm] above the floor.
- Each outlet is to be supplied with a dedicated circuit breaker in the distribution board.

EPS11.6 Conduit and Wiring

- All wiring to be concealed in PVC conduit.
- Conduit to be installed in accordance with SANS 10142-1 standards.
- Wiring to be copper, PVC insulated, and of the appropriate gauge as per load requirements.

EPS11.7 Earthing and Bonding

- Proper earthing and bonding to be implemented as per SANS 10142-1.
- Earth rods and earth conductors to be installed where necessary.

EPS11.8 Inspection and Testing

- The electrical installation must be inspected and tested in accordance with SANS 10142-1.
- A Certificate of Compliance (CoC) to be issued upon completion.

EPS11.9 Documentation

- The contractor must provide detailed as-built drawings and circuit diagrams.
- A maintenance manual for the electrical installation must be supplied.

EPS11.10 Health and Safety

- The contractor must adhere to all health and safety regulations as per the Occupational Health and Safety Act.
- Proper signage and protective measures are to be put in place during the installation process.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**EPS11.11 Warranty**

- The contractor must provide a minimum one-year warranty on the installation and all components.

EPS12 ELECTRICAL CABLE SPECIFICATION**EPS12.1 General Requirements****EPS12.1.1 Scope:**

- Supply, delivery, and offloading of 400 [V] armoured cables as per the requirements outlined in this document.
- The cable shall be suitable for use in both underground and above-ground installations.

EPS12.1.2 Standards:

- The cable shall comply with the relevant South African National Standards (SANS), including but not limited to:
- SANS 1507-3: Electric cables with extruded solid dielectric insulation for fixed installations (300/500 [V] to 1 900/3 300 [V])
- SANS 1411: Materials of insulated electric cables and flexible cords
- SANS 1574: Electric cables with extruded solid dielectric insulation for fixed installations (3.8/6.6 [kV] to 19/33 [kV])

EPS12.2 Technical Specifications**EPS12.2.1 Cable Construction:**

- Type: 400 [V] armoured cable
- Conductor Material: Annealed copper or aluminium, as specified
- Conductor Size: Range from 1.5 [mm²] to 500 [mm²]
- Insulation Material: Cross-linked polyethylene (XLPE) or polyvinyl chloride (PVC)
- Armouring: Galvanized steel wire armouring (SWA) or steel tape armouring (STA)
- Outer Sheath: UV-stabilized PVC

EPS12.2.2 Electrical Properties:

- Voltage Rating: 400 [V]
- Test Voltage: 2.5 [kV] (AC) for 5 minutes
- Current Rating: As per SANS 10142-1 (South African Wiring Code)

EPS12.2.3 Physical and Mechanical Properties:

- Operating Temperature Range: -10 [°C] to +90 [°C]
- Minimum Bending Radius: 12 times the outer diameter of the cable
- Fire Performance: Low smoke, halogen-free as per SANS 10142-1

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**EPS12.3 Quality Assurance****EPS12.3.1 Testing:**

- All cables shall be tested in accordance with SANS 1507-3 and SANS 1574 standards.
- Factory Acceptance Testing (FAT) to include insulation resistance, high voltage, and continuity tests.
- Type test certificates shall be provided with the tender submission.

EPS12.3.2 Certification:

- The manufacturer shall be ISO 9001 certified.
- All cables shall carry a SANS mark or equivalent certification mark.

EPS12.4. Packaging and Delivery**EPS12.4.1 Packaging:**

- Cables shall be supplied on sturdy, non-returnable wooden or steel drums.
- Each drum shall be clearly labelled with the manufacturer's name, cable type, size, length, and batch number.

EPS12.4.2 Delivery:

- The supplier shall ensure safe transportation and delivery to the designated site.
- Delivery schedule to be agreed upon with the purchaser.

EPS12.5 Documentation**EPS12.5.1 Documentation to be provided with the tender submission:**

- Detailed technical specifications
- Type test certificates
- Manufacturer's quality assurance plan
- Installation guidelines and manuals

EPS12.6 Warranty**EPS12.6.1 Warranty Period:**

- The cable shall have a minimum warranty period of 12 months from the date of final commissioning.

EPS12.7 Compliance and Verification**EPS12.7.1 Inspection:**

- The purchaser reserves the right to inspect the cables at the manufacturer's facility before delivery.
- Random sample testing may be conducted upon delivery to ensure compliance with the specified standards.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**EPS13 GENERAL ELECTRICAL INSTALLATION**

The work must be done in accordance with the Standard Specifications set out in this document.

EPS13.1 Introduction

This document outlines the tender specifications for the general electrical installation at **Vrede / Thembalihle Wastewater Treatment Works**. The work shall include the supply, installation, testing, and commissioning of all electrical systems necessary for the safe and efficient operation of the plant.

EPS13.2 Scope of Work

The scope of work includes, but is not limited to, the following:

- Supply and installation of electrical equipment.
- Cable management systems.
- Earthing and bonding.
- Lighting systems.
- Power distribution.
- Instrumentation and control wiring.
- Testing and commissioning.

EPS13.3 Standards and Regulations

All work shall comply with the latest editions of the relevant standards and regulations, including but not limited to:

- IEC Standards.
- National Electrical Code (NEC).
- Local electrical codes and regulations.

EPS13.4 Materials and Equipment**EPS13.4.1 Cables and Wiring**

- All cables shall be of the appropriate type, size, and rating for their intended use.
- Cables shall be installed in conduits or cable trays as required.

EPS13.4.2 Distribution Boards and Panels

- Distribution boards shall be metal-clad, dust, and water-resistant as per the plant's environmental conditions.
- Panels shall be equipped with circuit breakers, isolators, and protective devices as necessary.

EPS13.4.3 Solar Lighting

- Solar LED lighting shall be installed throughout the plant.
- Emergency lighting and exit signs shall be provided in accordance with safety regulations.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**EPS13.4.4 Earthing and Bonding**

- A comprehensive earthing and bonding system shall be installed to ensure the safety of personnel and equipment.
- All earthing shall comply with the relevant standards and provide a low-resistance path to earth.

EPS13.5 Installation

- All installations shall be carried out by qualified and experienced personnel.
- Cables shall be routed to avoid mechanical damage and shall be adequately supported.
- Electrical equipment shall be installed in accessible locations for maintenance and operation.

EPS13.6 Testing and Commissioning

- Upon completion of the installation, all systems shall be tested to ensure compliance with the specifications and standards.
- Test results shall be documented and submitted for approval.
- The contractor shall provide training for the operation and maintenance of the electrical systems.

EPS13.7 Documentation

The contractor shall provide the following documentation:

- As-built drawings.
- Operation and maintenance manuals.
- Test certificates and reports.

EPS13.8 Safety

- All work shall be carried out in accordance with the relevant health and safety regulations.
- Appropriate personal protective equipment (PPE) shall be worn by all personnel on-site.

EPS13.9 Warranty and Support

- The contractor shall provide a warranty for all equipment and installations for a period of 12 months from the date of commissioning.
- Support and maintenance services shall be available during the warranty period.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



ELECTRICAL TEST SPECIFICATION

MESS 10 GENERAL

All equipment will be inspected and tested. The Contractor will do all tests with the Engineer as witness. The Contractor must provide all testing facilities, instruments, all equipment, dummy loads, additional/temporary switchgear and cables as well as staff required for testing. The instruments must have valid test certificates issued by an accepted testing authority and the results of the test done must be recorded on a test certificate, of which the Engineer must receive two copies. The Engineer reserves the right to call for a calibration test on any instruments used during the test.

The entire cost of testing including supply of test equipment and staff, must be borne by the Contractor and an adequate allowance for such tests must be made in the Tendered price.

All equipment shall be verified against the drawings / specifications provided by the Engineer for the respective equipment. The wiring shall be verified in detail according the available schematic and single line diagrams.

The equipment shall comply with the requirements of all laws, codes, regulations, ordinances and statutes of the local, state and national bodies having jurisdiction over the site where the equipment is to be installed. In addition, the following shall be complied with:

- Act No. 85 of 1993: Occupational Health and Safety Act of South Africa, as amended (OHSACT)
- Act 8 of 2004: National Environmental Management and Regulations as amended (South Africa)
- Act 130 of 1993: Compensation of Occupational Injuries and Diseases (South Africa)

The standard of the tests and proposed repairs should be such that the Contractor can provide a 1-year warrantee on the equipment and workmanship.

MESS 11 SPECIFICATIONS OF EQUIPMENT

The details and specifications of the equipment to be tested will be provided by the Engineer. The schematic and single line diagrams will also be provided.

In the event of conflict between the reference codes and standards, drawings and specifications, clarification shall be obtained from the Engineer before proceeding with the tests.

MESS 12 TESTS

All tests should be carried out to the satisfaction of the Engineer by qualified personnel only. Sub-components for each type of equipment shall be tested individually. The overall operation and control philosophy shall also be tested. The conditions where under the tests are performed should be captured. This includes but is not limited to venue, date, ambient temperature, humidity, wind speed and dust / pollen count. Where required, a specialist or vendor might be required to test equipment or sub-components. The Contractor will be liable for the costs of such specialists or vendors. Test results shall not be evaluated by statistical methods.

Allowance should be made for excavations required to complete any test.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



If a cable cannot be tested as one unit, it shall be tested in sections.

Each type of equipment shall be tested in accordance with the prescribed tests as list in the following table:

Item	Test	Yes/No
1	General visual tests	
a	Construction / rigidness	
b	Steel (2mm 3CR12 for Panels) / rust	
c	Visible damage report to be done	
d	Paint finish visual inspection: suitable touch up paint requirements to be determined	

Item	Test	Yes/No
2	Cable	
a	Cable Insulation	
b	Earth continuity	
c	Phasing	
d	Connections and terminations	
e	Protection (rating of switch gear)	
f	Armoring (if applicable)	
g	Tests performed according to SABS 97 of 1991, SANS 1574:2004 and SANS 10198-13:2004	

Item	Test	Yes/No
3	Switch gear & panels	
a	Verify ratings (including fault current)	
b	Operation	
c	Locking mechanism	
d	Busbar marking / labeling	
e	Busbar connections	
f	Earthing test of panels	
g	Push button	
h	MCB in accordance with SANS 156:1977	
i	Tripping times according to Clause 4.5 of SANS 156:1977	
J	Surge arrestors and earthing	
k	Door insulation	
l	Indicator lights	
m	Glands	
n	Ventilation	
o	Interlocking	

Item	Test	Yes/No
4	Instrumentation	
a	Accuracy / Calibration	
b	Operation	
c	Current transformer ratios, accuracy, burden, polarity, magnetization curve, secondary resistance and secondary leakage reactance	
d	Metering to be verified for accuracy	

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Item	Test	Yes/No
5	Control Gear	
a	Operation	
b	High Voltage Insulation test	
c	All the sub-components to be tested:	
	Timers	
	Isolators	
	Fused switches	
	Moulded case circuit breakers	
	Air-break contactors	
	Current limiting circuit breakers	
	Direct on-line starters	
	Star/Delta starters	
	Variable speed drives	
	Instrument selector	
	Power Factor correction	
d	Primary and Secondary injection tests	

Item	Test	Yes/No
6	Motors & pumps	
a	Wiring & connections	
b	Verify rating & Specification	
c	Speed test	
d	Torque test	
e	Temperature while operating	
f	Starting current	
g	Operating current	
h	Winding impedance	
i	Winding insulation	
j	Cooling (if applicable)	
k	Noise level while operating	
l	Vibration	
m	Bearings & lubrication	
n	Ventilation openings checked for obstruction	
o	Direction of rotation	
p	Seals for submersible motors / pumps	
q	Pressure tests (except sump pumps)	
r	All other test mentioned in Appendix D to SABS 948	

Item	Test	Yes/No
7	Actuators	
a	Operation	
b	Input current measurement	

Item	Test	Yes/No
8	Electronic level control	
a	Communication	
b	Operation	
c	Diagnostic (if available)	

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Item	Test	Yes/No
9	Communication	
a	Cable continuity and resistance measurement	
b	Verify Fiber Optical connections	

Item	Test	Yes/No
10	Main supply	
a	Circuit breaker rating	
b	In-feed voltage	
c	Fault current	
d	Supply cable rating and protection	
e	Metering (current transformers class, accuracy etc)	

Item	Test	Yes/No
11	Additional Tests	
	Any additional test that the Contractor might deem necessary could be listed here. If more space is required attach a separate sheet	
a		
b		
c		
d		
e		
f		

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**MESS 13 CURRENT RATINGS – INTERNAL WIRING**

The following table provides the current rating for internal wiring:

Nominal cross-section mm ²	CONDUCTOR RATING (A)				
	Number of conductors bunched together				
	1	2 – 3	4 - 5	6 – 9	10 and more
1,5	13	12	10	9	8
2,5	17	16	14	12	10
4	22	20	18	16	13
6	29	26	23	20	17
10	40	36	32	28	24
16	55	49	44	38	33
25	74	67	59	52	44
35	93	84	74	65	56
50	11	107	95	83	71
70	14	133	119	104	89
95	17	160	142	124	107

MESS 14 REPAIR

All repairs shall be done in accordance with the specifications of the equipment. Suitable replacement parts of the same manufacturer and specification to be used at all times. Where such replacements parts are not available, the Contractor shall inform the Engineer and make recommendations with regards to similar parts according to the specifications. The highest quality replacement parts must be used.

The standard of the repairs should be such that the Contractor can provide a 1-year warrantee on the equipment and workmanship

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



RS REFURBISHMENT SPECIFICATION

RS 1.1. New security fencing

Where the facilities have no existing security fencing, the contractor will ensure that the security fencing comply with the following;

RS 1.3.1. The Inner Fencing

- The inner fencing will include all the posts, panels and access gates.
- Each panel section will have a vertical under-dig section, consisting of typically 500mm FLATWRAP.
- The panel sections will be minimum, 100mm x 100mm galvanized steel welded razor wire, over-laid (cladded & properly secured) with 75x75(2.0mm) Fence Diamond Mesh, for the total perimeter, from bottom to top.
- Minimum panel height, 2400mm.
- Minimum 730mmΦ RIPPER COIL, fitted (properly secured and supported) on top of the panels and in-between the posts, for the total perimeter.

RS 1.3.2. The Outer Fencing

- The outer fencing will include all the posts, panels and access gates.
- The outer fence will be installed 1500mm, parallel to the existing fence, on the outside of the existing fence.
- Each panel section will have a vertical under-dig section, consisting of typically 500mm FLATWRAP.
- The panel sections will be minimum, 100mm x 100mm galvanized steel welded razor wire, over-laid (cladded & properly secured) with 75x75(2.0mm) Fence Diamond Mesh, for the total perimeter, from bottom to top.
- Minimum panel height, 2400mm.
- Minimum 730mmΦ RIPPER COIL, fitted (properly secured and supported) on top of the panels and in-between the posts, for the total perimeter.
- The outer fence must be fitted with an alarm system to trigger, 1) any attempt to enter the outer fence or, 2) the cutting or damage to the outer fence. The alarm system must be remotely activated to activate a security response team to attend to the outer fence access or damage.

RS 1.3.3. The Inner Barrier

- The inner barrier will be installed between the inner and outer fence.
- The inner barrier will be fixed and secured to the inner fence.
- The inner barrier will consist of minimum, four (4x) 730mmΦ RIPPER COILS, stacked vertically on-top of each other, against the inner fence (properly secured and supported).
- This will allow inspection access width, in-between the inner and outer fence, of 750mm.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



RS 2 DRAIN, CLEANING & DREDGING OF WATER HOLDING & OTHER STRUCTURES

RS 2.1. Scope of works

The scope of works includes the draining, cleaning and dredging of any civil water holding or other structure, as per the specified requirements below.

RS 2.2. Draining

Draining will typically entail the following actions:

- Isolating the structure. This entail stopping, preventing or by-passing any hydraulic flow (raw sewage, partially treated waste water or storm water), entering into the structure being drained, into the next or approved alternative structure.
- Draining the structure. This entail removing, scooping or pumping out any liquids from the structure being drained.
- Removal and disposal of the drained liquid. This entails the collection, storage of the liquid, transporting for disposal at the WWTW, or at an approved disposal point. **NO DISPOSAL, OR POLLUTION INTO THE ADJACENT OR ANY OTHER NATURAL OR ENVIRONMENT AREA WILL BE ALLOWED!**

RS 2.3. Cleaning

Cleaning will typically entail the following actions:

- Remove foreign matter and settlement from the structure. This entails the removing, scooping, conveying, or any other means deemed necessary, to empty the structure completely, leaving it without any foreign matter or settlement. Foreign matter and settlement may consist of screenings, grit, sand or any other solid matter not supposed to gather or settle inside the structure.
- Remove and dispose of the foreign matter and settlement. This entails the collection, storage of the foreign matter and settlement, transporting, and disposal at the WWTW, or at an approved disposal point. **NO DISPOSAL, OR POLLUTION INTO THE ADJACENT OR ANY OTHER NATURAL OR ENVIRONMENT AREA WILL BE ALLOWED!**
- Clean the inside surfaces of the structure. This entails the washing, jetting or scrubbing of the internal surfaces, to enable the thorough inspection for water tightness and structural integrity.

RS 2.4. Dredging

Dredging will typically entail the following:

- Dredging typically entail the removal of foreign matter and settlement from the structure, whilst the structure is hydraulically filled and in operation.
- The equipment used to dredge, must remove foreign matter and settlement from the structure. Dredging equipment can typically be a floating pump, a fixed pump, a submersible pump, bottom surface traveling suction, boom/jib controlled, etc.
- The removed foreign matter and settlement must also be collected, stored, transported and disposed at the WWTW, or at an approved disposal point. **NO DISPOSAL, OR POLLUTION INTO THE ADJACENT OR ANY OTHER NATURAL OR ENVIRONMENT AREA WILL BE ALLOWED!**
- The contractor must prove, by means of a practical on-site test, sample analysis or real-time instrument monitoring, that the structure are free of any foreign matter or settlement.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**RS 3 ACCESS AND SAFETY EQUIPMENT****RS 3.1. Scope of works**

The scope of works includes the complete supply, refurbishment & repair, deliver, install, commission and up-holding during for the 12-month defects liability period, of the access and safety equipment for the particular structure and/or building, as per the specified requirements below.

RS 3.2. Works

Typical work entails the following:

- Refurbishment, entail mainly reusing the existing equipment, with acceptable repair work or partially replacement.
- Replacement, not using any of the existing equipment but full replacement, because of equipment being missing, very poor condition due to vandalism or wear & tear.

RS 3.3. Equipment

Typical equipment forming part of this scope of works, entail the following:

- Steps, structural steel or concrete.
- Ladders.
- Walkways.
- Grating.
- Covers.
- Handrails.

RS 3.4. Requirements

Typical access and safety equipment requirements, entail the following:

- All existing access and safety equipment must be refurbished.
- Additional access and safety equipment, where necessary must be supplied and installed.
- Equipment and application must comply with the OHS Act.
- Equipment must structurally comply with all SANS regulations.
- As far as possible, all access and safety equipment must be refurbished, repaired or replaced with fibre, synthetic, or synthetic recycled materials.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



RS 4 INTERCONNECTING PIPE WORK

RS 4.1. Scope of works

The scope of works includes the complete draining, cleaning, dredging, un-blocking, refurbishment & repair, commission and up-holding during for the 12-month defects liability period, of all "sub-soil" pipe lines, connecting main structures for the handling of the hydraulic flow, as per the specified requirements below.

RS 4.2. Works

Typical work entails the following:

- Draining, cleaning and dredging of the interconnecting pipe work. The contractor must ensure that the pipe line is clear and open for a thorough investigation, to determine the condition of the pipe line and if the pipe line is damaged. The inspection will determine the scope of refurbishment, repair or replacement work required.
- Refurbishment, entail mainly reusing the existing equipment, with acceptable repair work or partially replacement.
- Replacement, not using any of the existing equipment but full replacement, because of equipment being missing, very poor condition due to vandalism or wear & tear.

RS 4.3. Equipment

Typical equipment forming part of this scope of works, entail the following:

- Gravity pipe lines.
- Hydraulic pressure pipe lines.
- Pressure pump lines.
- Pipe material expected, AC, Concrete, PVC, Mild Steel or Stainless Steel.

RS 4.4. Requirements

Typical interconnecting pipe line equipment requirements, entail the following:

- All pipe lines receiving and conveying flow away from the particular structure, must be drained, cleaned and dredged.
- All pipe lines receiving and conveying flow away from the particular structure, must be thoroughly inspected.
- All work on the pipe lines must comply with the applicable sections of the OHS Act and the SANS 1200 regulations.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



RS 5 REPAIRS TO CIVIL STRUCTURES

RS 5.1. Scope of works

The scope of works includes the refurbishment, repair, replacement, commission and up-holding during for the 12-month defects liability period, of the civil structures, handling or treating the hydraulic flow, as per the specified requirements below.

RS 5.2. Works

The contractor must price the drain, clean and dredging of the structures under the bill of quantities. This will enable the inspection and determining the refurbishment, repair and/or replacement scope of works for the particular structure. The typical scope of works can entail the following:

- Minor repair work to the structure which does not include work to ensure the water tightness or the structural integrity of the structure.
- Sealing of the structure which will ensure the structure will be water tight.
- Repair work to ensure the structural integrity of the particular structure.
- Replacement, thus de-commissioning or demolishing the existing structure and replacing it with a new structure.

RS 5.3. Equipment (structures)

Typical equipment forming part of this scope of works, entail the following:

- Hydraulic conveyance channels.
- Hydraulic collection and division chambers.
- Process structures, for example settling tanks, biological reactors and contact structures.
- Storage structures, for example pump station storage sumps, ponds etc.
- Manholes, valve and meter chambers.
- Structural steel installations.
- Any other reinforced concrete or steel structure part of the pump stations and the waste water treatment works.

RS 5.4. Requirements

Typical structure requirements, entail the following:

- Any particular structure must perform their original intended design function.
- Any particular structure must be structurally sound.
- Any particular structure must be water tight.
- Any structure must contain their hydraulic liquid, house their mechanical equipment or any other feature required by the pump station or treatment process.
- The structure must comply with all applicable SANS 1200 requirements.
- The structure must comply with the OHS Act.
- Special requirements by the engineer and/or the client will be specified during the inspection and the determination of the scope or works for the particular structure.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



RS 6 BUILDING MAINTENANCE AND REPAIRS

RS 6.1. Scope of works

The scope of works includes the supply, deliver, repair maintenance and up-holding during for the 12-month defects liability period, of the buildings (Top Structures), as per the specified requirements below.

RS 6.2. WORKS

The contractor must thoroughly inspect the buildings, determine the scope of maintenance repair work and quote for the work. The maintenance repair work will entail the following:

- The work will include for the supply, deliver and install of all the material and labour required as per the requirement.
- The repair of the complete roof, including the covering (sheeting and/or tiles), support structure (Trusses, beams and purlins), gutters and down pipes, or any other accessories to ensure the 100% function-ability of the roof.
- The repair of the walls, including the main structure, doors (including proper security gates where necessary), windows (including proper burglar bars), vents, paint, plastering or any other accessories to ensure the 100% function-ability of the walls.
- The repair of the floors, including the slab, floor finishing, covers, steps or any other accessories to ensure the 100% function-ability of the floor.
- The repair of the access and safety equipment might overlap with some requirements specified under PS_C_003.

RS 6.3. Equipment (building structures)

Typical equipment forming part of this scope of works, entail the following:

- Main Office Building.
- Under-cover roof structures for infrastructure protection and operational purposes.
- Pump Station buildings.
- MCC Buildings.
- Storage and Staff Buildings.
- Chlorination Buildings.
- Any other civil infrastructure, not part of the civil concrete structures or as mentioned above.

RS 6.4. REQUIREMENTS

Typical building structure requirements, entail the following:

- Any particular building structure must perform their original intended design function.
- Any particular building structure must be structurally sound.
- Any particular building must comply with the National Building Regulation.
- Any particular building must comply with all applicable SANS 1200 requirements
- The structure must comply with the OHS Act.
- Special requirements by the engineer and/or the client will be specified during the inspection and the determination of the scope or works for the particular building structure.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



RS 7 GENERAL OHS ACT COMPLIANCE

RS 7.1. Scope of works

The scope of works includes the supply, deliver, install, implementation and up-holding during for the 12-month defects liability period, of the equipment and facilities required to comply with the OHS Act, with regards to the execution of the scope of works specified under this contract, as per the specified requirements below.

RS 7.2. Equipment

Typical equipment forming part of this scope of works, entail the following:

- PPE, specialized safety equipment and facilities, consumables etc., required for the equipment supplied under the scope of works.
- PPE, specialized safety equipment and facilities, consumables etc., required for the delivery, on and off-loading and transportation of equipment under the scope of works.
- PPE, specialized safety equipment and facilities, consumables etc., required for the installation and construction work executed under the scope of works.
- PPE, specialized safety equipment and facilities, consumables etc., required for the commissioning of equipment and infrastructure under the scope of works.
- PPE, specialized safety equipment and facilities, consumables etc., required for the operation and maintenance services under the scope of works.

RS 7.3. Requirements

The requirements for the General OHS Act Compliance entails the following:

- All the work executed under this contract, must comply with the OHS Act.
- The contractor must provide all equipment and facilities to comply with the above-mentioned specified requirements.

RS 8 PAYMENT & MEASUREMENT

The scope of works will be certified for payment as follows:

- Material on site will be certified for payment, as and when the material can be inspected for acceptance, on-site or an approved extended site. 80% of the material cost, less 10% retention (up to a maximum of 5% of the contract value), will be certified for payment.
- 100% of the supply, deliver and installation cost, less 10% retention (up to a maximum of 5% of the contract value), will be certified for payment, if and when the material has been installed, inspected and approved.
- Labour only items will be certified for payment, 100% of the labour cost, less 10% retention (up to a maximum of 5% of the contract value), if and when the work has been completed, inspected and approved.
- 2.5% of the maximum 5% retention money will be certified for payment, if the practical completion has been issued.
- The last 2.5% of the maximum 5% retention money will be certified for payment, after the 12-month defects liability period has elapsed.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



RS 9 EXECUTION OF WORKS METHOD STATEMENT

The contractor must submit as part of his tender bid, method statements for the following:

- A method statement for each different type of installation and construction action.
- The method statement must indicate which bill of quantity sections and items are applicable.
- The method statement must give a clear description of the type of action.
- The method statement must clearly describe and list the minimum labour requirement for the specific action.
- The method statement must clearly describe and list the minimum equipment and tools required for the specific action.
- The method statement must clearly describe the step-by-step chronological execution of the action.
- The method statement must clearly describe the risks involved with the specific action, and the contractor's precautionary provisions to eliminate and address the risks.
- The method statement must clearly indicate the specification and regulations considered to compile the method statement.
- The method statement must clearly indicate compliance with the OHS Act.

RS 21 SITE KEEPING

RS 21.1. Scope of works

The scope of works includes the assistance, execution of necessary actions and insurance that site keeping is done during the ongoing contract duration.

RS 21.2. Works

The site keeping scope of works will typically entail the following:

- Keeping the site clean of overgrown vegetation, cutting grass and trimming bushes and trees.
- Keeping the structures open for operation and maintenance access.
- Keeping the site clean of screenings, grit and other foreign material.
- Keeping the perimeter fence clean, 3m on the outside of the fence.

RS 21.3. Requirements

Requirements during the maintenance service, entail the following:

- The existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The contractor will at all times ensure, that the service delivery entity are assisted where ongoing refurbishment work takes place.
- The contractor will ensure minimum repair time to ensure the approved completion target date are met.
- Service means any form of action, work, support, material, equipment to ensure the operation of the facility.
- The service must at all times comply with the relevant Particular Specifications, SANS and OHS Act regulations.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**RS 22 SITE CLEARANCE****RS 22.1. Scope of works**

The scope of works includes the collection, removal, loading, transportation and disposal or off-loading of any scrap, rubbish or foreign material from the facility, during the ongoing contract duration.

RS 22.2. Works

The site clearance scope of works will typically entail the following:

- Collecting any scrap, rubbish or foreign material on the site.
- Removing, loading and transportation, any scrap, rubbish or foreign material, from the site to a designated site for disposal or storage.

RS 22.3. Requirements

Requirements during the maintenance service, entail the following:

- The existing operation of the pump station and WWTW are not implicated during the refurbishment process.
- The contractor will at all times ensure, that the service delivery entity is assisted where ongoing refurbishment work takes place.
- The contractor will ensure minimum repair time to ensure the approved completion target date are met.
- Service means any form of action, work, support, material, equipment to ensure the operation of the facility.
- The contractor must get approval for the storage and disposal sites before removing the scrap, rubbish or foreign material from the site.
- The service must at all times comply with the relevant Particular Specifications, SANS and OHS Act regulations.

RS 23 UPHOLD DURING THE 12-MONTH DEFECTS LIABILITY PERIOD**RS 23.1. Scope of works**

The scope of works includes the monitoring, operational and maintenance service, on all the equipment and infrastructure, forming part of the contractual scope of works, during a 12-month defects liability period.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



RS 24 POLLUTION MANAGEMENT

RS 24.1. Scope of works

The scope of works includes the monitoring, operational and maintenance service, on all the equipment and infrastructure, forming part of the pollution management actions, equipment, monitoring, operation and maintenance.

RS 24.2. Works

The pollution management scope of works will typically entail the following:

- Handling, bypassing, pumping or addressing in any other form, raw sewage or any other flow encountered on the site.
- The means of preventing, reducing or managing the pollution effect the flow will have on the surrounding areas or a water resource to which the flow is being discharged, temporarily or permanently.
- Monitoring and submission of proof of the pollution reduction due to the management actions.

RS 24.3. Requirements

Requirements during the maintenance service, entail the following:

- The establishment, put in place, construction or supply of equipment, to divert the flow in a way to allow to by-pass and dry working conditions, of the area or infrastructure to be refurbished or worked on.
- The establishment, put in place, construction or supply of equipment, of a means to reduce or prevent pollution to the receiving end of the by-pass flow.
- The contractor must submit a method statement, detailing the by-pass as well as the pollution management action. The method statement must be approved and accepted by the Engineer before commencing with these actions.
- The method of pollution management can be one of, but is not limited to one of the following options.
 - No pollution prevention actions will be required if the by-pass flow has no potential pollution risk. The Nation Water Act and Water Use Regulations will outline which flows has no potential pollution risk.
 - In the case where the by-pass flow can be directed to an active upstream or downstream treatment process, able to handle hydraulically and organically, the by-pass flow.
 - In the case where the by-pass flow can be contained in a storage space, which will have nor pollution risk, taking into consideration to drain the storage space after use and dispose the content in an appropriate manner.
 - In the case where the by-pass flow can only be discharged to the surrounding areas or water resources, the by-pass flow quality must be improved to allow discharge to the environment. Typically, chemical or bio-chemical treatment are expected to recuse the organic load on the environment. The Contractor may propose a bio-chemical for this application but must in his method statement include the detail technical data of the bio-chemical to be used and the proposed usage procedures and guidelines as specified by the product supplier.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- The Contractor must also include for all necessary infrastructure and equipment to facilitate the efficient operation, control and maintenance of the infrastructure and equipment, for the full duration of the refurbishment project.
- The Contractor may offer any other feasible and efficient method of addressing the pollution management for the Engineers consideration.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



DATA SHEET NO. 01

1.1 OXIDATION PUMP STATION

Designation:

Schedule 7: Oxidation Pump Station

Quantity:

2-OFF (Duty/Standby Pump Sets)

Pump Sets:

Manufacturer:

Place of Manufacture:

Type:

Model Number:

Duty Point: [l/s] & [m]:

Operating Speed: [rpm]

Efficiency @ Duty Point: [%]

Solids Handling Capability: [mm]

NPSH_R: [mm]

Absorbed Power @ Duty Point:

[kW]

Casing Material of Construction:

Impeller Type:

Impeller Material of Construction:

Air Release Valve Type & Model:

Base Plates:

Material of Construction:

Baseplate Thickness:

Corrosion Protection:

Coupling:

Type of Coupling:

Model Number: [mm]

Motor:

Manufacturer:

Place of Manufacture:

Power Rating: [kW]

Voltage: [V]

Frequency: [Hz]

Frame Size:

Class of Insulation:

Single- OR 3-Phase:

Output Speed:

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**Suction Pipework:**

Material of Construction: _____

Pipe Size and Wall Thickness: _____ [mm]

Flange Table Rating: _____

Corrosion Protection: _____

Type & Size of Isolation Valves: _____

Joint Sets Material and Grade: _____

Gaskets Material: _____

Pressure Gauges Size: [kPa] _____

Diaphragm Seals (Y/N): _____

Discharge Pipework:

Material of Construction: _____

Pipe Size and Wall Thickness: _____ [mm]

Flange Table Rating: _____

Corrosion Protection: _____

Type & Size of Non-Return Valves: _____

Type & Size of Isolation Valves: _____

Joint Sets Material and Grade: _____

Gaskets Material: _____

Pressure Gauges Size: [kPa] _____

Diaphragm Seals (Y/N): _____

Number of Pipe Support/s: _____

Material of Pipe Support/s: _____

Support/s Corrosion Protection: _____

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



DATA SHEET NO. 02

2.1 BIOFILTER RECIRCULATION PUMP STATION

Designation: Schedule 8: Biofilter Recirculation Pump Station

Quantity: 2-OFF (Duty/Standby Pump Sets)

Pump Sets:

Manufacturer: _____

Place of Manufacture: _____

Type: _____

Model Number: _____

Duty Point: [l/s] & [m]: _____

Operating Speed: [rpm] _____

Efficiency @ Duty Point: [%] _____

Solids Handling Capability: [mm] _____

NPSH_R: [mm] _____

Absorbed Power @ Duty Point: _____ [kW]

Casing Material of Construction: _____

Impeller Type: _____

Impeller Material of Construction: _____

Air Release Valve Type & Model: _____

Base Plates:

Material of Construction: _____

Baseplate Thickness: _____

Corrosion Protection: _____

Coupling:

Type of Coupling: _____

Model Number: [mm] _____

Motor:

Manufacturer: _____

Place of Manufacture: _____

Power Rating: [kW] _____

Voltage: [V] _____

Frequency: [Hz] _____

Frame Size: _____

Class of Insulation: _____

Single- OR 3-Phase: _____

Output Speed: _____

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**Suction Pipework:**

Material of Construction: _____

Pipe Size and Wall Thickness: _____ [mm]

Flange Table Rating: _____

Corrosion Protection: _____

Type & Size of Isolation Valves: _____

Joint Sets Material and Grade: _____

Gaskets Material: _____

Pressure Gauges Size: [kPa] _____

Diaphragm Seals (Y/N): _____

Discharge Pipework:

Material of Construction: _____

Pipe Size and Wall Thickness: _____ [mm]

Flange Table Rating: _____

Corrosion Protection: _____

Type & Size of Non-Return Valves: _____

Type & Size of Isolation Valves: _____

continued:

Joint Sets Material and Grade: _____

Gaskets Material: _____

Pressure Gauges Size: [kPa] _____

Diaphragm Seals (Y/N): _____

Number of Pipe Support/s: _____

Material of Pipe Support/s: _____

Support/s Corrosion Protection: _____

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



DATA SHEET NO. 3

3.1 SLUDGE RECIRCULATION HUMUS PUMP STATION

Designation: Schedule 9: Sludge Recirculation Humus Pump Station

Quantity: 2-OFF (Duty/Standby Pump Sets)

Pump Sets:

Manufacturer: _____

Place of Manufacture: _____

Type: _____

Model Number: _____

Duty Point: [l/s] & [m]: _____

Operating Speed: [rpm] _____

Efficiency @ Duty Point: [%] _____

Solids Handling Capability: [mm] _____

NPSH_R: [mm] _____

Absorbed Power @ Duty Point: _____ [kW]

Casing Material of Construction: _____

Impeller Type: _____

Impeller Material of Construction: _____

Air Release Valve Type & Model: _____

Base Plates:

Material of Construction: _____

Baseplate Thickness: _____

Corrosion Protection: _____

Coupling:

Type of Coupling: _____

Model Number: [mm] _____

Motor:

Manufacturer: _____

Place of Manufacture: _____

Power Rating: [kW] _____

Voltage: [V] _____

Frequency: [Hz] _____

Frame Size: _____

Class of Insulation: _____

Single- OR 3-Phase: _____

Output Speed: _____

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**Suction Pipework:**

Material of Construction: _____

Pipe Size and Wall Thickness: _____ [mm]

Flange Table Rating: _____

Corrosion Protection: _____

Type & Size of Isolation Valves: _____

Joint Sets Material and Grade: _____

Gaskets Material: _____

Pressure Gauges Size: [kPa] _____

Diaphragm Seals (Y/N): _____

Discharge Pipework:

Material of Construction: _____

Pipe Size and Wall Thickness: _____ [mm]

Flange Table Rating: _____

Corrosion Protection: _____

Type & Size of Non-Return Valves: _____

Type & Size of Isolation Valves: _____

Joint Sets Material and Grade: _____

Gaskets Material: _____

Pressure Gauges Size: [kPa] _____

Diaphragm Seals (Y/N): _____

Number of Pipe Support/s: _____

Material of Pipe Support/s: _____

Support/s Corrosion Protection: _____

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



DATA SHEET NO. 4

4.1 WASTE SLUDGE HUMUS PUMP STATION

Designation: Schedule 10: Waste Sludge Humus Pump Station

Quantity: 2-OFF (Duty/Standby Pump Sets)

Pump Sets:

Manufacturer: _____

Place of Manufacture: _____

Type: _____

Model Number: _____

Duty Point: [l/s] & [m]: _____

Operating Speed: [rpm] _____

Efficiency @ Duty Point: [%] _____

Solids Handling Capability: [mm] _____

NPSH_R: [mm] _____

Absorbed Power @ Duty Point: _____ [kW]

Casing Material of Construction: _____

Impeller Type: _____

Impeller Material of Construction: _____

Air Release Valve Type & Model: _____

Base Plates:

Material of Construction: _____

Baseplate Thickness: _____

Corrosion Protection: _____

Coupling:

Type of Coupling: _____

Model Number: [mm] _____

Motor:

Manufacturer: _____

Place of Manufacture: _____

Power Rating: [kW] _____

Voltage: [V] _____

Frequency: [Hz] _____

Frame Size: _____

Class of Insulation: _____

Single- OR 3-Phase: _____

Output Speed: _____

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**Suction Pipework:**

Material of Construction: _____

Pipe Size and Wall Thickness: _____ [mm]

Flange Table Rating: _____

Corrosion Protection: _____

Type & Size of Isolation Valves: _____

Joint Sets Material and Grade: _____

Gaskets Material: _____

Pressure Gauges Size: [kPa] _____

Diaphragm Seals (Y/N): _____

Discharge Pipework:

Material of Construction: _____

Pipe Size and Wall Thickness: _____ [mm]

Flange Table Rating: _____

Corrosion Protection: _____

Type & Size of Non-Return Valves: _____

Type & Size of Isolation Valves: _____

Joint Sets Material and Grade: _____

Gaskets Material: _____

Pressure Gauges Size: [kPa] _____

Diaphragm Seals (Y/N): _____

Number of Pipe Support/s: _____

Material of Pipe Support/s: _____

Support/s Corrosion Protection: _____

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



DATA SHEET NO. 5

5.1 AIR SCOUR BLOWERS

Designation:

Schedule 11: Air Scour Blowers

Quantity:

2-OFF (Duty/Standby Pump Sets)

Blower Set:

Manufacturer:

Place of Manufacture:

Type:

Model Number:

Duty Point: [l/s] & [m]:

Operating Speed: [rpm]

Efficiency @ Duty Point: [%]

Absorbed Power @ Duty Point:

[kW]

Casing Material of Construction:

Impeller Type:

Impeller Material of Construction:

Discharge Pipework:

Material of Construction:

Pipe Size and Wall Thickness:

[mm]

Flange Table Rating:

Corrosion Protection:

Joint Sets Material and Grade:

Gaskets Material:

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



DATA SHEET NO. 6

6.2 SUBMERSIBLE PUMP

Designation:

Schedule 11: Submersible Pump

Quantity:

1-OFF

Pump Sets:

Manufacturer:

Place of Manufacture:

Type:

Model Number:

Duty Point: [l/s] & [m]:

Operating Speed: [rpm]

Efficiency @ Duty Point: [%]

Solids Handling Capability: [mm]

Absorbed Power @ Duty Point:

[kW]

Casing Material of Construction:

Impeller Type:

Impeller Material of Construction:

Discharge Pipework:

Material of Construction:

Pipe Size and Wall Thickness:

[mm]

Flange Table Rating:

Corrosion Protection:

Joint Sets Material and Grade:

Gaskets Material:

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



DATA SHEET NO. 7

7.1 SODIUM HYPOCHLORITE DOSING SYSTEM

Designation:

Schedule 12: Disinfection

Quantity:

1-OFF (2-Pump Chemical Dosing Skid)

Dosing Skid

Material of Construction:

Material Thickness:

Description of Dosing Skid:

Pipework Material and Class:

Dosing Pumps:

Manufacturer:

Place of Manufacture:

Type:

Material of Construction:

Model Number:

Duty Point: [l/s] & [m]:

Ancillary Equipment:

Flow-Based Dosing: [Y/N]

Storage Tank:

Capacity:

Material of Construction:

Specific Gravity: [SG]

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



DATA SHEET NO. 8

8.1 FINAL EFFLUENT OVERFLOW WEIR

Designation:

Schedule 8: Disinfection

Quantity:

1-OFF

General:

Name of Manufacturer:

Place of Manufacture:

Make and Model:

Channel Dimensions:

Width: [mm]

Depth: [mm]

Hand Stop:

Recess Required: [mm] x [mm]

Head of Effluent: [mm]

Weir Type:

Weir Height: [mm]

Weir Thickness: [mm]

Materials of Construction:

Weir:

Fixing Anchors:

Corrosion Protection:

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C3.5: PARTICULAR SPECIFICATIONS

CONTENT

PART	HEADING
PAM	MECHANICAL PARTICULAR SPECIFICATION
PAE	ELECTRICAL PARTICULAR SPECIFICATION
PAC	CIVIL PARTICULAR SPECIFICATION

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAM GENERAL REFURBISHMENT MECHANICAL SPECIFICATION****PAM 1 PUMPS****PAM 1.1. Scope**

This section of the Specification includes the manufacture, testing, protection, supply and off- loading of pumps and base-plates used for the pumping of raw or potable water at ambient temperatures as stated. Pump duties shall be in accordance with the Project Specifications. Electrical motors do not form part of this section of the Specification. This section of the Specification must be read in conjunction with the Project Specification and Electrical specifications.

PAM 1.2. Interpretations**Abbreviations**

For the purposes of this Specification the following abbreviations will apply:

BS	-	British Standards Institution
SABS	-	South African Bureau of Standards
DIN	-	German Standards Institute
ISO	-	International Organization for Standardization
SIS	-	Swedish Standards

Standards

Pumps shall comply with this Specification and with the current and most recent issues of the following standards where applicable:

BS 970	Wrought steel in the form of blooms, billets, bars and forgings
BS 1400	Copper alloy ingots and copper and copper alloy castings
BS 3100	Specification for steel casting for general engineering purposes
BS 3468	Austenitic cast iron
BS 4360	Specification for weld able structural steel
BS 4675	Mechanical vibration in rotating and reciprocating machinery
BS 4999	General requirements for rotating electrical machines
BS 5316q	Acceptance tests for centrifugal, mixed flow and axial flow pumps
BS 4504	Flanges and bolting for pipes, valves and fittings
SABS 20	Copper alloy ingots and castings
SABS 1123	Steel pipe flanges
SIS 05 59 00	Pictorial surface preparation standards for painting steel surfaces

PAM 1.3. Materials**PAM 1.3.1. General**

All materials shall possess qualities adequate for purpose for which they are to be used. All materials and properties claimed for these materials shall, unless specified otherwise in this document, comply with the requirements of the most recent edition of the appropriate South Africa or other internationally recognized standard specification.

For each type of equipment, the Manufacturer shall indicate the materials used for each of the proposed sub-assemblies.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



The equipment shall be manufactured using new prime quality materials taking into account the latest technical innovations.

All components shall have a surface finish in relation to their importance, their position and their intended purpose.

Rolled steels and all castings shall be clean and free of blisters, porosity, shrinkage, holes, cracks or other flaws that may be detrimental to their use.

The Tenderer shall indicate in his tender the proposed materials for each component of the assembly.

PAM 1.3.2. Castings

No repair of cast components will be permitted without the prior approval of the Engineer.

The filling of casting defects shall be carried out by highly qualified welders only, according to the latest welding techniques.

Any cast component requiring filling at any fabrication stage after the first anneal shall be subjected to further annealing treatment unless stipulated otherwise.

Cast components shall not be wrapped or distorted in any way and shall not show any increase in dimensions (beyond that shown on the fabrication drawings) likely to cause interference with other components in the erection of the item of equipment for which they were made.

The structure of cast components shall be homogeneous and free of non-metallic impurity. If, at critical points of a cast component, there is too great a concentration of impurities or alloy, the component shall be rejected.

PAM 1.3.3. Pump Casings

Pump casing shall be of cast iron or cast steel. The grade of material proposed should be selected appropriate to the quality of water to be pumped as specified in the Project Specification.

PAM 1.3.4. Impellers

Impellers shall be cast in either phosphor bronze (PBI according to BS 1400 or 1 C according to SABS 200), aluminium bronze (AB1 according to BS1400 or 1E according to SABS 200) or chrome steel (316C11 according to BS 3100, or DIN 1.4313), unless otherwise specified in the Project Specification. Cast iron or leaded gunmetal shall not be permitted.

PAM 1.3.5. Pump shafts

Pump shafts shall be of EN 26 steel to BS 970 or similar

If a Tenderer wishes to propose an alternative material this should be motivated with details of the benefits to be achieved.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAM 1.3.6. Stainless steel**

The stainless steel used shall be of the type easily jointed or fitted by electric welding. Stainless steel which cannot withstand the effects of welding or associated heat treatment will not be accepted.

PAM 1.3.7. Fasteners

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

Washers shall be provided under all bolt heads and nuts. The threads of bolts and studs shall be cleaned and coated with a graphite/grease, copper based or other approved compound before assembly. The threads of all bolts and studs used with the equipment supplied shall be to the same standard. The length of bolts should be such that at least two threads protrude beyond the nuts, but not more than four threads. The threaded end of all bolts must point the downstream direction of flow

The Tenderer shall indicate in his tender the materials proposed for each part of assembly.

PAM 1.4. Plant

The Tenderer shall satisfy the Engineer of the sufficiency of the manufacturer's workshops to handle the manufacture, testing and protection of the pumps strictly in accordance with the Specification.

PAM 1.5. Manufacture**PAM 1.5.1 General**

Preference will be given to Pumps with non-overloading characteristics and a shaft rotational speed not exceeding 1 500 r/min.

Pumps shall be of the highest quality and suitable for continuous operation over long periods with the minimum of maintenance at high sustained efficiency.

End-suction pumps constructed on the back pull-out principle shall be provided with spacer pump motor couplings to enable the pump bearing housing, shaft and impeller to be removed without disturbing the pipe work or alignment.

The proposed layout of the pump station shall be indicated on the drawings accompanying the tender documents. They shall be studied carefully and all alterations to the lay-out, pipe work or buildings required to suit the pump offered, shall be set out clearly in letters and drawings accompanying the tender. The final layout shall be agreed upon by the Contractor and the Engineer prior to the commencement of manufacture of any of the equipment.

All equipment offered as well as all work carried out, shall comply fully with the requirements of the Occupational Health and Safety Act 85/1993 and the Machinery and Operational Safety Act 6/1983.

Taking into consideration specific speed calculations, efficiencies and reliability of the pump sets the proposed pump types shall be justified in the Tender. Double-Suction Axially Casing Split Pumps will be preferred unless otherwise specified in the Project Specification.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Arrangements incorporating multiple pump units coupled in series to achieve the duties specified in the particular specifications will not be favorably considered unless otherwise specified.

The arrangements of impellers shall be such as to reduce the residual axial thrust to a minimum. Designs incorporating a double suction will be preferred.

A design and arrangement of the pump casing which ensures that it is not necessary to disconnect the delivery pipe work for the purpose of removing or replacing the complete rotating element will receive favourable consideration.

Suction and delivery details: The orientation of the suction and delivery pipes shall be such as to facilitate maintenance whilst being designed for minimum losses and no air traps.

PAM 1.5.2 Pump Characteristics

The pump shall have stable, non-overloading characteristics.

The Tenderer shall submit with this Tender for each pump offered the following characteristic curves.

With respect to flow (in m^3/s)

- total head; in meters (0% to 120% of duty flow)
- power absorbed; in kilowatts (50% to 120% of duty flow)
- efficiency; (0% to 120% of duty flow)
- net positive suction head (NPSH) requirements: recommended, 0% head drop, and 3% head drop relative to pump shaft center line, in the case of horizontal spindle pumps;

with respect to speed:

- torque requirements rated in absolute units.

The Contractor may be called upon to provide further curves at the request of the Engineer, especially for starting and stopping analysis, in connection with surge analysis in the rising mains.

The efficiency curve shall be flat over a wide range in order to provide efficient working with various pump operating conditions. It shall conform to the requirements of the Project Specification.

Unless specified to the contrary, the proposed pumps shall be able to operate without perceptible signs of cavitation in the full range of the operating envelope specified, pump sets running singly or in parallel. Throttling shall not be allowed. Should there be any doubts, the Contractor shall be called upon to carry out an inspection of the pumps and carry out NPSH tests to prove the equipment, at the Contractors expense. If the pumps are found to be faulty, the Contractor shall be given a responsible period to remedy the problem. Thereafter if the Contractors is unable to resolve the problem it shall be cause for rejection.

PAM 1.5.3 Pump Casings

No welding, burning, filling or plugging of defective castings shall be permitted without the Engineer's permission in writing, following an inspection of the defects.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



The inspection and testing of castings and test bars shall be in accordance with BS 3100.

The dimension and drillings of the suction and discharge flanges integral with the pump casting shall be to SABS 1123 to design pressures specified.

The pressure rating of the delivery flanges shall be at least equal to the maximum suction static pressure, plus the pump shut-off pressure. The minimum pressure rating of the flanges shall be 1 MPa (10 bar).

All pump casings shall be hydrostatically tested at the Manufacturer's workshop and in the presence of the Engineer or his Representative. The test pressure applied shall be equivalent to 1,5 times the pump shut off head, or alternatively twice the duty head specified, whichever is the greater.

Suitable lifting rings shall be provided on the casings.

The pumping casings should be fitted with suitable replaceable stationary wear rings. These wear rings should be appropriately heat treated for operation in conjunction with the impeller, or impeller wear ring material selected.

PAM 1.5.4 Impeller

The casting shall be free of blowholes and other defects. No welding, burning, filling or plugging of defective castings shall be permitted without prior approval being obtained from the Engineer in writing, following an inspection of the defects.

All water passages shall be polished to a smooth finish. Water passages which cannot be machined shall wherever possible be hand ground and filed to template.

Each impeller shall, after final machining and dressing, be independently statically balanced and the completely assembled rotating element with coupling shall be dynamically balanced.

The first critical speed of the rotating element shall be at least 1,3 times running speed.

PAM 1.5.5 Pump Shaft, Sleeves and Diffusers

Pump shafts shall be of an approved material, and of sufficient dimensions to transmit the power to which they will be subjected without undue torsional or bending stresses and deflection

The shafts shall be stress-relieved after initial machinery, and ground to final size.

The shafts shall be suitably designed for the reception of the impeller which shall be adequately secured to the shaft in such a manner as to be readily removable without damage to either the shaft or the impeller.

The Contractor shall ensure that both the critical speed and torsional oscillation characteristics of the combined pump and motor rotating elements are satisfactory for all possible condition of operation.

The shafts shall be adequately protected with replaceable sleeves of an approved bronze or other similar approved non-corrodible material at all areas where wear and/or corrosion could possibly be expected. The replaceable shaft sleeves exposed to the pumped water

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



shall be manufactured from a material compatible with the impeller material selected. These sleeves shall be readily removable without causing damage to either the shafts or the sleeves.

PAM 1.5.6 Shaft Coupling

The pump and motor shall be connected by a flexible coupling in such a manner that it shall not uncouple whichever way the impeller may be rotating.

The coupling shall accommodate small axial, lateral and angular misalignments without imposing undue stresses on the shaft and bearings. Refer to PT 8.3.

The coupling shall be enclosed in a stationary solid-plate guard to the Engineer satisfaction.

PAM 1.5.7 Pump Bearing and Lubrication

Bearings and Lubrication

If anti-friction bearings are fitted a design life of at least 40 000 operating hours is required. The bearings in the pump casing together with its lubricating systems shall be suitable for the particular circumstances. The particular type and system offered by the Tenderer shall be fully specified.

The pump rotating element shall be positively located in the axial direction. If specified thrust bearings shall be of the tilting pad-type (Mitchell or similar).

Journal bearings consisting of white metal lined bronze sleeves split on the horizontal centre line and lubricated with an oil ring shall be preferred.

All bearings shall be suitable for shaft rotation in both directions.

Preferably the same type of bearing will be chosen for motor and pump.

If not, the necessary allowance shall be made when aligning pump and motor. Adequate provision shall be made for the cooling of oil for bearings, particularly as the pumps may run continuously in ambient temperatures of the order of 40°C.

Oil reservoirs of sufficient capacity shall be fitted with easily accessible oil level indicators, clearly marked to indicate the standing and running oil levels.

All internal surfaces in continuous contact with the lubricating oil such as oil reservoirs, piping, etc, shall be thoroughly cleaned either chemically or by shot blasting and protected by a method to be approved by the Engineer until such time as the system is changed with oil. No site welding of oil circulating pipes will be permitted.

The entire lubricating system shall be failed safe with alarms set to indicate automatic change-over to the stand-by unit.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PAM 1.5.8 Glands and Seals

- Reliability

Reliability of glands is of prime importance. Pumps incorporating low pressure glands where the pressure at the glands does not exceed the main suction supply pressure will be preferred to pumps with shaft glands exposed to higher pressures.

- Glands

Low pressure glands of the conventional stuffing box pattern utilizing packing rings one each side of lantern rings will be acceptable for the first stage of the pumps. Lantern rings shall be easily removable. The shaft sleeves shall be ground with a polished finish on the wearing surface, and the gap between the sleeves and the follower shall be such that the packing will not be extruded into the gap. Make and type of packing shall be to the approval of the Engineer.

It will be the responsibility of the Contractor to provide filters if the quality of the water necessitates filtration. The flow of water to or from the glands shall be clearly visible.

If mechanical seals are called for, they shall require no separate water supply and shall be suitable for the water to be pumped. Seal selection shall be done in collaboration with the seal manufacturer and proof that this has been done may be requested.

If, in the opinion of the seal manufacturer, the quality of the water is such that a flush would be required to the seals, Tenderers are required to provide for a suitable system. Such a system shall be self-contained and inclusive of all necessary separators, filters, connections and auxiliary pipe work to provide the required flow to the seals at the appropriate pressure. The auxiliary pipe work and fittings should be in a suitable grade of stainless steel.

Mechanical seals shall be balanced and provided to be suitable for the water pumped. Spare wearing components shall be supplied and delivered when the pump is installed, the cost being included in the price of the pump.

The Tenderer shall supply with his Tender, full details of all pump seals and glands incorporated showing clearly all proposed materials, finished clearances, etc.

PAM 1.5.9 Pump Vent and Drain Fittings

Stainless Steel vent cocks be provided and fitted at all local high points on each pump casing. These cocks shall be of adequate size to enable the entrapped air to be released freely. Stainless Steel pipes shall be neatly led from priming cocks, gland and casing drain points to a suitable main tundish. Galvanized drainage pipe works of adequate size shall be provided and installed to collect the waste water from each pump set and to lead it to the drain leading to the pump house sump.

PAM 1.5.10 Base-plate

The pump and motor base-plate shall be rigid. The upper face of each base-plate upon which the pump and motor are located, shall be machined flat and smooth to ensure that the pump is supported properly directly to the base-plate, without the use of spacers. Provision must be allowed to align the motor correctly to the pump through the use of suitable shims or spacers, the combined height of which should not exceed 3mm.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



For every motor, two jacking bolts at right angles with a lock nut shall be provided at every corner.

PAM 1.5.11 Monitoring Devices

If specifically stated in the Project Specification, one or more of the following monitoring items shall be required:

Full details of the sensing equipment (thermocouples, etc), and of the associated control and monitoring or indicating equipment shall be submitted with the tender offer. Evidence shall also be submitted that adequate spares and services are readily available in this country.

PAM 1.5.12 Temperature Sensors

Either thermocouples or resistance temperature detectors shall be installed, depending on which is more suitable to the duty and application.

Location of temperature probes:

- a) Separate temperature probes shall be installed at the sleeve and/or rolling bearings of each pump and motor and at the gland housings of the pump to monitor the temperatures at these points.
- b) The probes shall be spring-loaded to ensure positive contact with the bearing shells or gland stuffing boxes.
- c) Each probe shall be clearly identified by means of an engraved marking on the sheath and shall be individually calibrated. Test certificates covering the calibration results of all temperature probes shall be submitted to the Engineer.
- d) Temperature detectors offered, shall be suitable for operation in conjunction with temperature indicating, monitoring, alarm and trip equipment of Conlog or equivalent design.
- e) If grease lubricated bearings are offered, the Tenderer shall indicate if temperature detectors can in fact be used. If temperature detectors are not feasible, the Tenderer shall indicate alternative means of monitoring bearings.
- f) Pockets for standard mercury filled glass thermometers shall be provided adjacent to all pockets serving temperature indicating instruments. Pockets for standard thermometers shall have chained covers to prevent the ingress of dirt when not in use and shall be so arranged as to permit the accurate measurements of the bearing temperature. The pockets shall contain a small amount of oil and shall therefore be orientated within 30° of the vertical, horizontal pockets are not acceptable.
- g) Each pump casing shall be fitted with a thermo switch, Fenwall, or equal approved make to safeguard the pump in the event of inadvertent sustained operation against a closed discharge valve. The thermo switch shall be calibrated to close when the temperature of the water in the pump casing exceeds 40°C.

Contractor

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Witness 2

Employer

Witness 1

Witness 2



PAM 1.5.13 Pressure gauges

- a) Each pump set shall be equipped with two 150 mm dial diameter flush mounting pressure gauges. The gauges shall be calibrated in kilopascal and the angle shall suit the particular application. The gauge shall be filled with glycerin, and the bubble shall be out of the range of usual reading. The gauges shall be of a type that is possible to recalibrate (dead-weight method) and reset on Site.
- b) These meters shall indicate water pressure in kilopascal and shall have a range at least 50 % higher than the normal duty point. However, in all cases the gauges must have a range at least 30% higher than the shut off, or maximum, head which the pump is capable of generating with the system conditions taking into consideration the maximum static suction pressure possible.
- c) The meters for the suction side of pumps shall be compound gauges and shall be capable of indicating a negative pressure of up to 100 kPa. However, in all cases the gauges must have a range at least 30% higher than the maximum static suction pressure possible.
- d) All pressure gauges shall be supplied and installed complete with isolating Steel cocks, piping, etc. and fitted with a pulsation snubber in stainless steel.
- e) Due to the quality of the water, those submitting tenders should satisfy themselves of the reliable operation of the gauges. Where necessary they must include for the pressure gauges to be fitted with diaphragms.

PAM 1.5.14 Pump set vibration sensors

- a) Suitable vibration sensors shall be mounted on each pump set to stop it on detection of Detection of excessive vibration. The sensors shall be situated as close as possible to those bearings where the highest vibration levels are encountered.
- b) The monitoring of vibration shall be made via a suitable timing device in order to avoid tripping when starting the pump set or during other transitory conditions.
- c) The pumps shall comply with the requirements of BS4999.

PAM 1.5.15 Automatic air vents

If an automatic air vent is specified for the pump casing, it shall be fitted with an indicator to show the open and closed positions of the air vent. The air vent shall be suitable for remote operation and the control of the air vent shall be mounted on the control panel inside the pump house.

PAM 1.5.16 Gland leakage detection

A device to monitor gland leakage shall be supplied and fitted with adjustable alarm contacts designed to close when gland leakage rises to a pre-set value.

PAM 1.5.17 Wear limit switch

Multistage pumps should be fitted with a wear limit switch to protect the pumps against damage after normal wear of the wearing rings have taken place after a period of operation.

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PAM 1.5.18 Corrosion Protection

- Internal protection

All traces of rust, slag, silica or other contaminants shall be removed by mechanical wire brushing. Abrasive blast cleans all interior surfaces to SA 22 (near white) metal finish to the Swedish Standard SIS 05 59 00. The blast profile shall fall within the limits 40-60 microns.

A thorough vacuuming of the interior surface shall be carried out to remove all traces of the abrasive grit before application of internal surface finish.

Apply by brush, or airless spray, three coats of an approved two-part epoxy coating, or equivalent, to give a dry film thickness of between 50 and 70 microns per coat. The intermediate coat shall be a different colour to the first and final coat. The total minimum dry film thickness for the complete system shall not be less than 150 microns.

- External protection

All sharp edges, laminations and protrusions shall be removed by mechanical grinding, where after all traces of rust, slag, silica or other contaminants shall be removed by mechanical wire brushing. The entire surface shall be degreased using a suitable water emulsifiable degreaser. Surfaces shall be left clean and dry prior to coating.

One coat of zinc phosphate high build primer shall be applied (Plascon Code UC 183 or imilar) by airless spray to a dry film thickness of 75 µm, and left 8 hours to dry.

The primer shall be followed by one coat of universal undercoat, (Plascon Code UC 1 or similar) applied by brush, roller or airless spray to a dry film thickness of 30 µm. This coat shall be left to dry for 16 hours.

The final coat shall be one coat of universal gloss enamel, (Plascon Code G or similar) applied by brush, roller or airless spray to a dry film thickness of 25µm. This shall be left to dry for 20 hours. Colour will be as directed by the Engineer.

PAM 1.5.19 Designation and Information Plates

Each pump shall be supplied with an information plate – preferably chromium plates – secured to the pump casing in a visible position indelibly marked with the following details:

- Maker's name, pump type and serial number
- Year of manufacture
- Rated duty of pump in liters per second
- Head in meters at rated duty
- Pump speed in revs per minute
- Impeller diameter
- Mass of completely assembled pump in kilogram
- Types and sizes of Bearings
- Letters and figures shall be engraved, or embossed, not stamped

PAM 1.5.20 Interchangeability

Where two or more similar pump sets are required, the pumps and motors shall be interchangeable in all respects

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAM 1.6. TOLERANCES**

The tolerances as specified in this Specification or the appropriate SABS or BS Standards, shall apply.

PAM 1.7. INSPECTION, TESTS AND COMMISSIONING**PAM 1.7.1 General**

Contractors shall, if requested make available for inspection, their internal Quality System Manual, their Standard Procedure Manual and their Works Instructions. Preferences shall be given to Contractors who have been audited and found to satisfy the requirements of the ISO 9000 Quality system.

Inspection and tests required of the Contractor include the tests and inspections in the workshops and the inspections and tests at Site.

Depending on the results of the tests and inspections, penalties may be applied and, in certain cases, part or all of the equipment may be rejected, as set out hereinafter.

The cost of all tests and inspections shall be included in the Tender. For instance, the cost of commissioning and testing at Site shall be stipulated in the Price Schedule under the section provided or included as part of the cost of erection. (Except for the cost of power and water consumed.) No claim for traveling expenses or further time required for testing will be allowed.

Tenders shall fully acquaint themselves with the properties of the water to be pumped. Any wear or portions of the pump or ancillary equipment that will affect its operating efficiency during the Period of Maintenance will result in the pump set being rejected.

Sign of cavitation pitting on pump parts will not be acceptable.

Leakage forms any oil, water or air circuit will not be acceptable.

Leakage at the glands shall be controlled to the minimum required and drained to the Pump Station sump.

Operation of pumps shall be free from undue vibrations throughout the full range of normal running conditions. Vibration levels should not exceed the limits determined by VDI 2059 for good vibration behaviour.

In no case shall temperature-rise above the ambient temperature reach or exceed 40°C for any mechanical component. For temperature-rise of bearings see Clause PT 5.7.7.

In the case of routine tests concerning standard equipments or material quality control tests, not attended by the Engineer or his Representative, tests reports or certificates in duplicate shall be submitted to Engineer.

The Contractor shall notify the Engineer or his Representative in writing two weeks in advance, of the place and dates at which the equipment may be inspected and tested.

The Engineer or his Representative will inform the Contractor of his intention to attend the test or the inspection and propose a date which suits him. If the date preferred by the Engineer is later than ten days after the first possible date, the Contractor shall be entitled to perform the test or inspection without the presence of the Engineer.

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Witness 2

Employer

Witness 1

Witness 2



If on any agreed date the equipment to be inspected or tested is not ready and the test or inspection has to be postponed the Contractor shall be held responsible for the traveling and/or living expenses of the Engineer and/or his Representative.

When tests and inspection have met the satisfaction of the Engineer or his Representative a certificate of Workshop Acceptance will be issued by the Engineer. The Contractor shall not pack and dispatch to Site any equipment before receiving the relevant "Certificate of Workshop Acceptance."

The Engineer's acceptance shall in no way relieve the Contractor of any obligation with regards to the Specification.

PAM 1.7.2 Tests

PAM 1.7.2.1 Performance tests

Each pump complete with its driving unit shall be tested at the Manufacturer's works, or other location approved by the Engineer to "Class B" requirements of BS 5316 Part 2, and the efficiency carefully measured. Variations from the actual running conditions of the pumps are allowed as defined in the standard. Unless otherwise explicitly mentioned, cavitation tests are required at work.

The tests shall be witnessed by the Engineer or his Representative and details of the tests and the results obtained, duly signed by the appointed Witness, shall be submitted to the Engineer before dispatch of pumping units from the Manufacturer's workshop.

The rotating elements of the pumps and motors shall preferably be dynamically balanced before assembly. The residual unbalance should be better than ISO 1940 grade G 6.3. The good balance of the whole pump set will be checked by measuring the absolute vibration of pump and motor bearing housings.

Tests shall be performed with the pump set on sound foundations, similar to those expected at Site.

Measurements shall be taken in the three axes at each bearing, i.e., axial and two radial components at right angles to each other.

Performance and vibration tests as described above are to be performed before installation on Site for all pump sets more than 22 kW. If these tests are impractical or impossible at the pump manufacturer's works, Tenderers must state this in their Tender and explain the reasons why it is so. The Engineer may be prepared to consider alternative proposals for testing provided these proposals are submitted with the Tender and are clearly described and defined. If this is not done, the Tenderer will be penalized for the cost necessary to have the tests performed in another workshop.

All pieces of equipment subject to water, oil or air pressure shall be tested at a pressure not less than one and a half times the design pressure.

Each piece shall withstand the hydrostatic test pressure without exhibiting signs of sweating, undue deformation and stressing, or defect of any kind.

Hydrostatic testing shall be done with blank flanges bolted on the flanges of the piece. The use of tie-bolts or other forms of restraint applied across the blank flanges to restrain

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



the bodies from deflecting under the applied test pressure will not be permitted without the Engineer's approval.

The hydrostatic test pressure shall be maintained for a period of at least 10 minutes.

PAM 1.7.2.2 Performance Test Results

At Works

- a) The overall percentages of efficiency as calculated from the tests should not be less than the appropriate guaranteed figures at the duty points by more than 3%.
- b) The measured flow rates should not differ from the guaranteed deliveries at any point other than the duty points on the characteristic curves as supplied by the Tenderer by more than 5%.
- c) The NPSH requirement should be met for the specified duty point. Where requested by the Engineer additional tests will be required to demonstrate the pump performance at run out conditions, or where the NSPH available is critical
- d) The Contractor will be allowed a period of eight weeks to carry out any amendments to the plant which he may consider necessary to meet the guaranteed figures. Any period granted for design amendment shall not extend the Contract Period.
- e) Further tests shall then be carried out at the Contractors expense and if the test results in question are still not within the limits specified, the Engineer shall have the right to:
 - either reject the entire plant and recover all monies already paid to the Contractor, or let the Contractor continue with the installation of the pumps sets which may be subjected to penalties or rejection as defined hereinafter then the performances tests at Site are performed

At Site

At the time of performance tests at Site:

- should the test results obtained for either efficiency, flow rate, NPSH or vibration still vary beyond the limits indicated in clause PT 7.3.1 above, the Contractor will again be allowed a further four weeks to make such amendments as may be considered necessary and if after these amendments have been made the test results in question are still not within the figures which have been guaranteed, the Engineer reserves the right, according to circumstances, to reject the plant entirely
- any other discrepancies, abnormal wear or malfunctioning of plant which may be observed during the Acceptance Tests shall be corrected by the Contractor without delay.
- The date of completion shall be the date on which the Acceptance Tests at site have been satisfactorily completed and the plant is in a fully operational state in accordance with the Specification.
- Any period granted for design amendments shall extend the Period of Maintenance by a corresponding amount.

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Witness 2



PAM 1.7.3 Commissioning

- a) On completion of mechanical and electrical erection and as soon as water is available and other circumstances permit, the Contractor shall arrange for the commissioning of all units of the pumping plant in the presence of the Engineer. The Contractor shall ensure that his equipment is suitably prepared before giving the Engineer fourteen days' notice in writing of the date of commissioning.
- b) Before the commissioning, the Contractor shall satisfy himself and subsequently prove to the Engineer that all items on the following checklist have been checked and are functioning correctly.
 - Visual check of general appearance of plant.
 - Check power supply to motor available.
 - Determine the direction of rotation.
 - i) Remove coupling
 - ii) Correct if necessary
 - Check if pump is turning freely by hand.
 - Check axial float of pump
 - Check thermocouple operation/calibration if required.
 - Check if pump requires gland packing (Mech. Seal flushing).
 - Check pumps and motors for correct grade and quantity of bearing lubricants (oil/grease packed).
 - Alignment of pump and motor.
 - Suction valve open (bypass open).
 - Discharge valve closed (bypass open).
 - Check if discharge line is full of water.
 - Bleed of air on pump and pipe works.
 - Cooling water to bearings.
 - Check balancing water if required.
 - Monitoring and operating equipment are functioning correctly.
 - Test run of pump.
 - i Number of recommended start - stop of motor.
 - ii Bearing temperature (motor and pump).
 - iii Pump speed.
 - iv Suction pressure.
 - v Discharge pressure.
 - vi (Volts) (Amps) (kW).
 - vii Quantity pump is pumping.
 - viii Vibration levels.
 - ix Rundown time of pump and motor.
 - x Simulate an emergency shut-down of pump.
 - xi Check pump and pipe work for water tightness.

NOTE: The Contractor to ascertain from the Pump Manufacturer whether the items on the check list are sufficient for the successful commissioning of the pump sets.

- c) The pump sets shall be run without interruptions separately for at least 4 hours or such further time as may be required to reach stable operating conditions (particularly, motor temperatures shall be stable).

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- d) If the prescribed duration cannot be achieved, the initial commissioning shall take place at a date to be agreed upon by the Contractor and the Engineer. It is to be borne in mind that the penalties for late delivery shall be linked with the initial commissioning.
- e) After the above commissioning, the plant shall be run under approved supervision for not less than two months before the Acceptance Tests are conducted. The Contractor must satisfy himself that the operators are in a position to operate the plant safely and correctly should he be absent from Site during this period.
- f) Commissioning shall not be considered to be complete until the plant is capable of continuous operation by fully trained operators of the Employer and until two months have elapsed and the plant has passed the Acceptance Tests as specified.
- g) The Acceptance Tests shall be performed only if and when every item of the whole Contract is fulfilled and if and when each piece of equipment, including the monitoring and control devices, is working properly. The Engineer is entitled to postpone the Acceptance Tests if any part of the Contract is not to his satisfaction or if the plant has not been successfully operated for at least 200 hours.
- h) The Certificate of Commissioning for the equipment is issued by the Engineer only when the results of the Acceptance Test, recorded in a report prepared and submitted by the Contractor, are found satisfactory.
- i) Final Operation and Maintenance Manuals shall be made available before the Certificate of Commissioning is issued.
- j) The Period of Maintenance (or Guarantee Period) commences at the date of the Certificate of Commissioning.
- k) During the first 14 days of operation of the scheme, the Contractor shall be on site to rectify any problems with the scheme within 24 hours of being telephonically notified. During the remainder of the maintenance period, the Contractor shall within 14 days of being notified, commence rectifying any possible problems that the Employer may encounter with the equipment supplied under this Contract.
- l) Should the Contractor fail to meet the above requirements, the Employer may appoint others to undertake the necessary repair work at the Contractor's cost
- m) After the satisfactory conclusion of the Acceptance Tests on Site and the issue of the Certificate of Commissioning, the Contractor shall guarantee the satisfactory operation and functioning of the entire plant covered by the Certificate of Commissioning for a period of twelve months measured from the date of the Certificate of Commissioning.
- n) The Contractor shall make good, free of all charges, any defects arising during this Period of Maintenance including the replacement of all defective parts and their installation and commissioning. This guarantee shall apply to all defects arising during proper use of the plant, due to faulty design or maintenance instructions, inferior materials or poor workmanship.
- o) Maintenance by the client's personnel during the Period of Maintenance shall be limited to cleaning and lubrication only as instructed by the Contractor. All other maintenance or adjustments shall be carried out by the Contractor.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- p) The final Certificate will be issued by the Engineer when the Period of Maintenance has elapsed and all Contractual obligations have been met in accordance with the General Conditions of Contract.

PAM 1.8. Installation of pump sets

PAM 1.8.1 Couplings

All pumps are to be matched for coupling to their respective motors. Couplings shall impose no restriction on normal end play or expansion and shall be provided with a removable guard, painted red. The direction of rotation shall be indicated with a clear arrow painted on the exterior of the coupling guard. The latter shall be designed thus to render reversed mounting impossible.

PAM 1.8.2 Grouting of Base-Plates

Base-plates shall be grouted after the alignment of pump sets has been approved. The Contractor must provide details of the grouting procedure he intends to utilize. Grouting of base-plates shall be done by the Contractor and he shall ensure full grout penetration between each pump base and relevant base-plate.

PAM 1.8.3 Pump Set Alignment

PAM 1.8.3.1 General

It is accepted that all new pump sets have been aligned on the base-plates in the factory. A certain amount of base-plate deformation is possible during transit and installation. Therefore, the alignment shall be rechecked on site following a hot run as specified hereafter. Two main checks are to be carried out, viz.

- a) angular alignment and
- b) radial alignment of the pump shaft

The checks are to be done on all pump sets.

PAM 1.8.3.2 Preparation

Before any check, the following preparations shall be completed.

Final grouting to the base-plate shall be completed.

Driving units shall be isolated from the power supply. The Contractor shall ensure that no damage can be caused by turning either unit (driving or driven unit).

Couplings should be fixed to their respective shafts and the segments must be free to move relative to each other. Where the method of coupling is too tight to allow free movement between the two half-couplings the rims should be marked so that readings can be taken when the two marks are in line.

PAM 1.8.3.3 Alignment Checks (See attached Data Sheet)

Angular Alignment

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- i Clamp two clock gauges diametrically opposite coupling pin holes of the driving or driven half-coupling, the plunger ends resting on the back of the opposite half-coupling.
- ii With one gauge at the top and one at the bottom set both gauges to zero.
- iii Turn both couplings through 180°. If the alignment is correct, the readings on the gauges should be numerically the same, although not necessarily zero.
- iv Adjustment should generally be made on the outboard end of the pump.
- v Turn both couplings through 90° and set the clock gauges to zero. Repeat step(iii).
- vi Note: This method does not require axial location of either half coupling.

Intersection of Axis (Radial Alignment)

- i Clamp one clock gauge into one of the coupling holes in the driving or driven
- ii half-coupling, the plunger end of the clock gauge seating on the rim of the other coupling.
- iii Rotate the couplings together and note the readings at each quarter turn.
- iv Adjust the position and heights of the units until uniform clock readings are obtained.

Note: Where the operating temperature of a unit has the effect of lifting the centre line of one machine in relation to the other, allowance in the height of the appropriate machine must be made. Height adjustment must be in accordance with the manufacturer's specifications.

PAM 1.8.3.4 Tolerances

- i Angular Alignment: The angle between two half-couplings shall not be more than 0,01° for speeds up to 1500 rpm. This corresponds to a variation of 0,05 mm and 0,02 between readings on a 300 mm dia. coupling.
- ii Redial Alignment: If readings vary by more than 0,10 mm (i.e., 0,05 mm eccentricity) for 1500 rpm adjustments shall be made.

PAM 1.8.3.5 Grouting of Base Plates

- i A gap of approximately 25 mm is provided between the base-plate and top of the foundation.
- ii Following approval of initial pump set and pipe work alignment, The Contractor shall erect suitable formwork along the base-plate perimeter and shall grout the entire aforesaid gap, foundation bolt pockets and base-plate volume up to the top surface of the base-plate. Appropriate grout holes shall be provided on the base-plate surface for this purpose. The Contractor shall timeously, prior to erection, submit to the Engineer full details of the grout type required, which should attain a design compressive strength of 30 MPT within 10 days.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- iii Prior to execution of final shaft alignment checks, the grouting operation shall have been completed, the grout adequately cured and all foundation bolts tightened.
- iv Final alignment control checks to be performed in the presence of the Engineer (or his appointed representative), immediately following a hot run.
- v Alignment Control Sheets will be completed for every unit checked, and will be signed by both the Engineer and the Contractor. The original copy will be kept by the Engineer and a duplicate by the Contractor.
- vi For alignment control sheet, see attached.

PAM 1.8.3.6 Installation of Dowel Pins

Following approved alignment of pump sets, suitable dowel pins shall be fitted to facilitate correct re-location of pump sets.

PAM 1.8.3.7 Manufacturer's Certificate of Approval

Following wet commissioning of pump sets, the pump manufacturer or his approved supplier shall check the installation and when satisfied shall issue to the Engineer a certificate approving installation in compliance with the manufacturer's specifications.

The Contractor shall furthermore, upon commissioning, perform vibration tests in the horizontal and vertical planes of each and every bearing housing. The results are to be endorsed by the pump and motor manufacturers for acceptability and handed to the Engineer within 14 days from the commencement of the Defects Liability Period.

It is further required of the Contractor to perform same measurements upon each and every maintenance visit during the Defects Liability Period. The results shall be logged and shall be endorsed by the pump and motor manufacturers for acceptability and handed to the Engineer within 7 days after each maintenance site visit.

PAM 1.9. Measurement And Payment

Measurement and payment will be done in accordance with the methods stated below:

PAM 1.9.1 Supply and Delivery

Pump sets/motor will be measured per unit including the following:
Pumps, motors, couplings, coupling material, base-plates and monitoring items as individually itemized.

Design, manufacture, purchase, protection, supply, handling, transport and profit.
Fixing material required to secure monitoring equipment to pump/motor.

Fixing material required to secure the pump and motor to the base-plate.
Temporary storage and maintenance during storage, should it be required.

The required tests and inspections at the manufacturer's work.

Operating and Maintenance Manuals as well as drawings in accordance with the specification.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Commissioning of each pump set/motor as specified.

PAM 1.9.1 Individual Performance Checks

Pay – item	Unit

Performance testing of pumps/motors
by independent institutions
(Provisional item)

No

Should the Client require performance testing of the pumps or motors by independent institutions such as the South African Bureau of Standards, a separate pay-item will be provided in the Schedule of Quantities. The tendered rate shall include for the transporting to and from the institution, off-loading, handling, etc., as well as all fees payable to the institution for each pump/motor unit tested.

PAM 1.10. Ancillary Equipment

Details of spares and special tools are to be listed in the Data Sheet.

The Mechanical Contractor will be responsible for the supply, delivery to site and erection of all ancillary equipment, in the form of holding down bolts, rawl-bolts, pipe clips, small pipes, grease piping etc. to complete the Mechanical Contract.

The Mechanical Contractor will also be responsible to compile a manual in which all the relevant mechanical equipment is described together with the routine maintenance, lubrication schedules etc for proper running of the plant.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



ALIGNMENT CONTROL SHEET

CLIENT:.....

CONTRACT NO:.....

STATION:..... MACHINE TYPE:

UNIT NO: REF NO:

ALIGNEMENT BETWEEN:

FACE TO FACE

PERIPHERAL

METHOD OF ALIGNMENT: Dial indicator

READINGS GIVEN IN: mm

ALIGNMENT OF GEAR FITTED O:.....

MEASUREMENTS TAKEN ON:

WICH SHAFT ROTATED:

VIEWED FROM:

DISTANCE BEWEEN SHAFT ENDS:

WHEN SHAFT IN WHICH AXIAL POSITION:.....

REMARKS: Suction / Delivery pipes connected.
 All foundation bolts tightened / loose.
 Final grouting done / not done.

.....

Date:

Time:

.....

.....

CONTRACTOR

ENGINEER

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



PAM 2 PENSTOCKS, WIERS, ADJUSTABLE WEIRS, HANDSTOPS AND STOPLOGS

PAM 2.1. Scope

This Contract covers the supply, delivery, transport, handling, installation, commissioning, testing, adjustment, handling over in complete working order and upholding during the Defects Liability Period of all type penstocks complete with operating equipment, hand stops, adjustable weirs and stop logs.

PAM 2.2. Materials

The thickness of materials shall be suitable for the duty required.

PAM 2.3. Design

All parts shall be designed for the duty required, but the minimum factor of safety against structural failure shall not be less than 3, based on the working stress of the material. In the design, due consideration shall be given to the thickness of materials with regard to corrosion and operating conditions. The force required at a hand wheel or crank to raise a gate or open a valve shall be in the order of 100 Newton per hand and the design parameters must be submitted in the Technical Data Sheet.

PAM 2.4. Penstocks And Valves

The frames and gates of wall mounted as well as channel type penstocks shall be made of grade 304 stainless steel.

All gates shall be well guided with no possibility of jamming. The gates shall be held uniformly against the side facings of the frames by the action of adjustable wedges and shall provide drop-tight closure under the conditions listed in project specification. All penstocks shall be of the level invert type fitted with renewable seals of a non-biodegradable material on the invert.

The sluice gates shall be dimensioned such that their installation in the channels and openings shown on the drawings is facilitated. The sluice gate shall be standard items and shall be installed so that head frames shall be flush with vertical channel walls and do not project horizontally into the channel. All nuts, bolts, washers and other components, shall be manufactured from stainless steel.

The channel sluice gates shall be robustly designed and constructed, having vertical and horizontal ribs to withstand pressures from both directions. The matching head frame shall be adequately designed to resist distortion, and both the gate and the frame shall have machined seating faces to ensure perfect sealing. The head frame shall extend above the concrete channel, to support the gate in the fully open position.

Seating pressure as well as unseating pressure may act on any channel or circular sluice gate and the sluice gate shall be able to resist these pressures.

Holding down bolts of penstocks fixed against concrete walls shall be made of Grade 304 Stainless Steel.

Channel sluice gates shall be provided with rising spindles.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAM 2.4.1. Adjustable Overflow Weirs**

The adjustable overflow weirs shall comply with the following requirements:

- i They shall have stainless steel indicators showing the degree of adjustment of the weirs in mm.
- ii They shall be horizontal after installation with a maximum allowable variation from the horizontal not exceeding 1 mm.
- iii They shall be watertight underneath and at the sides of the frame.
- iv All equipment shall be resistant to the corrosiveness of sewage. Holding- down bolts, washers, etc. shall be of stainless steel.

PAM 2.4.2. Hand Stop

The following requirements shall be applicable to hand stops:

- i Each hand stop shall be supplied with an stainless steel frame extending to the top of the concrete or masonry. The frame shall be grouted into an opening in the concrete or masonry. Each hand stop shall be capable of sliding in and out of the frame.
- ii Each hand stop shall seal 100% watertight under all circumstances. This may be achieved with the use of neoprene sealing material.
- iii Hand stops and frames shall be manufactured from 4,5 stainless steel plate. Each hand stop shall be robust and provided with reinforcing elements designed by the supplier to the approval of the Engineer. The reinforcing elements shall effectively prevent buckling under full static head conditions.

PAM 2.4.3. Stop logs

Each stop logs set shall comply with the following requirements:

- i The stop logs sets shall be supplied with stainless steel frames extending to the top of the concrete or masonry. The frames shall be grouted into the openings in the concrete or masonry in such a way that the stop logs are capable of sliding in and out of the frame. The stop logs sets shall be watertight under all normal operational circumstances.
- ii The stop logs and frames shall be manufactured from stainless steel plate. Each stop log shall be provided with reinforcing elements designed by the supplier to the approval of the Engineer. The reinforcing shall effectively prevent buckling under full differential static head conditions.
- iii The maximum vertical dimension of any individual stop log shall not exceed 150 mm.
- iv Each individual stop log in any one set shall have the same vertical and horizontal dimensions.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- v Each individual stop log shall be provided with two lifting lugs.
- vi A neat stainless steel stand or pair of stainless steel hooks shall be installed in close proximity of each installed set of stop logs for the storing of stop logs when removed from the frame.
- vii Each set of stop logs shall be provided with two portable stainless steel lifting hooks, each fastened with a 200 kg capacity stainless steel ante-loss chain or UV-stabilized 200 kg capacity nylon rope to a suitable bracket on the hand railing or walkway structure. The chain or rope shall be long enough to facilitate easy operation of the lifting hooks. The lifting hooks shall be used to manipulate individual stop logs by hooking into lifting lugs.
- viii Enough individual stop logs shall be supplied in each set to effectively span a minimum distance as shown on relevant drawings.

PAM 2.5. Corrosion Protection

Corrosion protection must be carried out according project specification

PAM 3 MANUFACTURE AND SUPPLY OF VALVES

PAM 3.1. Scope

The section of the Specification includes the manufacture, testing and supply of valves for the conveyance of raw or potable water at ambient temperatures in pipes under pressure.

PAM 3.2. Standards

The most recent issues of the following standard specifications will apply for the purpose of this Specification.

SABS 144	:	Cast-iron single door reflux valves
SABS 191	:	Cast steel gate valves
SABS 192	:	Cast steel single door reflux valves
SABS 664	:	Cast iron gate valves for waterworks
SABS 665	:	Cast iron gate valves for general purposes
BS 5155	:	Cast iron and carbon steel Butterfly valves
ISO 2441	:	Pipeline flanges for general use – shapes and dimensions of pressure tight surfaces
SABS 1123	:	Steel pipe flanges
SIS 05 5900	:	Pictorial surface preparation standard for painting steel surfaces

PAM 3.3. Materials

PAM 3.3.1. Sluice Valves

The valve body, bonnet, thrust dome, gate and glands shall be cast iron or cast steel as specified and depending on the required test pressures.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Body and gate sealing rings shall be of bronze, gunmetal or stainless steel. RSV gate shall be nitrile rubber covered, and fully encapsulated. The rubber shall not be removed from the guides of the gate.

Spindles shall be of high-grade stainless steel.

An isolating valve must be able to check the specified water pressure from both sides.

PAM 3.3.2. Butterfly Valves

Valve bodies and discs shall be of high-grade cast-iron or cast steel as specified and depending on the required test pressures.

The disc shaft or stub-shaft shall be of stainless steel located in self-lubricating bearings. Sealing rings, seal retaining rings, body seat rings and associated screws shall be of stainless steel.

A butterfly valve must be able to check the specified water pressure from both sides.

PAM 3.3.3. Reflux Valves

Valve bodies shall be of cast iron or cast steel depending on the specification or test pressures.

Valve doors shall be of cast iron or cast steel.

The valve body and doors or disc shall be fitted with replaceable stainless-steel body and door seat rings.

PAM 3.3.4. Air Valves

Valve bodies, covers and shield plates (large orifice) shall be of cast iron.

The balls shall be of stainless steel.

PAM 3.4. Manufacture

PAM 3.4.1. General

The design pressure of the valves shall not be less than the pressure specified subject to a minimum of 1000 kPa.

All valves shall be double-flanged with bolt holes drilled off-centre all-in accordance with the requirements of SABS 1123 or as otherwise specified.

The Tenderer shall give as a function of the downstream pressure the maximum acceptable discharge of water through the valves without risks of vibration and cavitation. The Tenderer shall also submit the head-loss characteristics of the valves.

The design pressure will be hand stamped on the top edge of the flanges of valves in kPa.

If specified, valves shall be supplied with by-passes to be bolted on to the body of the valve and not to the adjoining pipe work.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Valves shall be fitted with position indicators if specified. Fully closed, fully open and intermediate positions shall be indicated in corrosive proof and robust design indicators.

Arrows shall be cast on all hand wheels together with the wording "TO OPEN" or "TO CLOSE". The closing direction shall be clockwise unless otherwise specified.

In the case of cap top valves, an aluminium disc of at least 100 mm diameter and with the same wording and arrows shall be slipped over the spindle and retained by the cap.

All valves shall be supplied complete including bolts, nuts, washers and gaskets in accordance with the class of valve. Bolts shall be of sufficient length to allow not more than three screw threads to protrude outside units after complete tightening of the assembly. Gaskets for flanged joints shall be of compressed asbestos fiber to BS 2815 Grade A and full faced with a minimum thickness of 3mm for pressures up to and including 1 600 kPa cloth-inserted rubber may be used.

The following information shall accompany the tender:

- Description
- Flange Drilling
- Maximum working pressure
- Maximum unbalanced pressure
- Test pressure
- Manufacturers number
- Material of components
- Gearing
- Accessories

PAM 3.4.2. Sluice Valves

Double-flanged, wedge-gate, internal (non-rising) spindle sluice valves of the waterworks pattern are required to comply fully with SABS 9191 or SABS 664 where applicable.

Only full-way valves will be accepted (i.e. the gate must be clear of the waterway in the fully open position).

The maximum force required to turn the hand wheel at the maximum torque shall not be greater than 100 N per hand at the hand wheel run (Total effort = 200 N) when operating at an unbalanced pressure equal to the rated working pressure of the valve. This may be achieved with the aid of gearing of a suitable ratio.

Where gears are used replaceable shear pins shall be provided to prevent damage to the valve if excessive pressure is used.

PAM 3.4.3. Butterfly Valves

Horizontal spindle type butterfly valves complete with gearing, hand wheels and flanged at both ends with separate bolting for joining to the adjacent pipe work is required.

Wafer valves or valves fitted with studs for attachment to the adjacent flanges are not permitted.

Valves shall be drop-tight when closed and metal to metal sealing is not acceptable.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



All resilient seals shall be removed and readily replaceable on Site with the valve in position.

Resilient seals shall be retained by corrosion resistant securing elements to prevent corroding in position (e.g. bolts, set screws, etc.)

The valve-water seal shall be of the following types:

- a resilient seal fixed to the edge of the disc by corrosion resistant securing elements sealing on a stainless steel or bronze insert fixed in the body.
- a resilient seal fixed to the body of the valve by corrosion resistant securing elements sealing on a stainless steel or bronze insert fixed in the edge of the discs.

PAM 3.4.4. Reflux Valves

Reflux valves shall be double-flanged and comply with SABS 144.

Valve bodies and seals shall be free of pockets that will allow dirt accumulation and prevent the doors from closing fully.

Stops or an approved resilient material shall be fitted into the body to prevent the doors from fluttering under full flow conditions.

Valves shall be designed to allow for rapid but non-slamming closing characteristics.

PAM 3.4.5. Air Valves

Air valves shall be supplied with double-flanged, wedge gate internal (non-rising) spindle sluice valves for isolation, which unless otherwise specified shall confirm in all respects to this specification.

PAM 3.4.6. Electric Actuators (Applicable for Valves and Sluices)

When specified, the valves shall be fitted with electric, motor-driven flood proof IP 67 actuators of robust design, capable of closing the valves under all unbalanced pressures.

The Tenderer shall state the maximum torque required to operate the valve in his Tender. In determining this maximum torque an allowance shall be made for any deterioration that could be expected to occur in the bearings during the life of the valve. The actuator shall be capable of transmitting twice this maximum torque without any of its components suffering permanent damage. This shall be proven to the Engineer's satisfaction by workshop tests.

The actuators shall be capable of restraining the valve in any position under all possible conditions of operation, and shall not, in any circumstances, be capable of becoming self-motorized as a result of the dynamic torque loading on the disc or plunger.

All gearing shall be manufactured in accordance with BS 436 Class C and shall be machine cut. All components requiring lubrication shall be adequately lubricated and totally enclosed flood-proof casing fabricated in cast iron and/or die cast aluminium to suit the service weather proof casing whether the valve is to be installed in the open or under cover. Actuators shall also be fitted with mechanical stops to prevent excessive turning and shall be provided with replaceable shear pins.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Hand wheel shall be fitted to all actuators. The direction of rotation to close the valve shall be clockwise when viewed from above the end of the input shaft and from the position of operation. In addition, they shall be clearly and indelibly marked with an arrow showing the direction of closing and the words "Close" and "Toe".

Whether the valve is actuator driven or manually operated, the maximum force required to turn the hand wheel at the maximum torque defined above shall not be greater than 100 N per hand at the hand wheel rim. (Total effort= 200 N.) For large valves the minimum of complete revolutions of the hand wheel to move the valve gate from fully open to fully closed shall not be less than 100.

All electric actuators shall be provided with reversing contactors: local and remote control shall be provided; a device making the local control non-operative shall also be provided on the relevant remote-control panel.

After factory tests, the actuators shall be removed from the valve and delivered to Site in separate boxes to safeguard against damage.

PAM 3.4.7. Protection

All materials and workmanship to comply with relevant SABS specifications.

Internal Protection

Internal surfaces of valve bodies and discs shall be grit blasted to a 2 1/2 of SIS 05 50 00 finish. Successive coat of an approved non-toxic epoxy resin paint suitable for spray application (Cupon EP 2300 or similar) shall then be applied to give a final dry film thickness of 250 µm. Drying times between successive layers shall be strictly in accordance with the requirements of the paint manufacturer

As an alternative to the protection as specified above, the Contractor may be required to use either a solvent less epoxy paint system or a fusion bonded epoxy powder coating as specified in the Project Specification.

External Protection

External surfaces of valve bodies shall be wire brushed to a 3 of SIS 05 59 00 standard and painted with one layer zinc chromate primer to SABS 679 Type I (dried film thickness 50 µm). This will be followed by two alkyd-based undercoat (each coat 25µm thick) and one alkyd based enamel finishing coat to SABS 630 Grade 1 (dried film thickness 25 µm). Final colour will be as specified by the Engineer.

Machined flanges will be panted with a protective coating of shellac or similar.

PAM 3.4.8. Tolerances

Tolerances as specified in the appropriate SABS or BS standards shall be apply to this Contract.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAM 3.4.9. Testing and Inspection****PAM 3.4.9.1 Testing by Manufacturer**

The Manufacturer shall carry out all tests to ensure that valve materials confirm to the requirements of the relevant SABS or BS Specification. These tests will not necessarily be attended by the Engineer but records must be kept and all test results shall be made available to the Engineer.

PAM 3.4.9.2 Testing by Independent Body

The Engineer may appoint an independent recognized body to conduct control tests. Samples required for such tests will be provided by Manufacturer free of charge and sampling will be done by this body in accordance with the relevant SABS or BS Specification.

The cost of such control tests will be borne by the Employer.

PAM 3.4.9.3 Inspection

Visual, operational and dimensional inspection of valves as well as inspection of protective coatings will be carried out by the Engineer and/or the Manufacturer in the Manufacturers workshops prior to the dispatch of valves to site.

Inspection by the Engineer shall in no way relieve the Manufacturer of any of his obligations to design, manufacture and supply valves strictly in accordance with the Specification.

PAM 3.4.9.4 Hydrostatic Testing

All hydrostatic tests will be witnessed by the Engineer and the Manufacturer will give at least one-week prior notification to the Engineer of the proposed dates for such tests. Valve bodies will be close end tested to at least 1,5 times the working pressure. Test pressures will be maintained for at least 5 minutes and valve bodies will be water tight in all respects at the test pressure.

Assembled valves will be open-end tested to 1,5 x working pressure for materials strength and soundness. Valves will be drop tight from both directions over the complete range of pressures from 0 to 1,5 x working pressure.

Each valve will be supplied with a test certificate certifying that it complies in all respects with the requirements of this Specification.

PAM 3.4.10. Measurement and Payment**General**

Tendered prices shall include for the following unless otherwise specified in the Project Specification.

- Protective coating as specified.
- Couplings and/or jointing material for each type of valve.
- Packing and temporary protection against damage during transport and delivery.
- Temporary storage and maintenance if required.
- Delivery and storage of material on site or in a store as specified.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



- Testing and inspections at Manufacturer's works.

Valves will be measured per unit of each type.

PAM 3.5. Ancillary equipment

Details of spares and special tools are to be listed in the Data Sheet.

The Mechanical Contractor will be responsible for the supply, delivery to site and erection of all ancillary equipment, in the form of holding down bolts, rawl-bolts, pipe clips, small pipes, grease piping etc. to complete the Mechanical Contract.

The Mechanical Contractor will also be responsible to compile a manual in which all the relevant mechanical equipment is described together with the routine maintenance, lubrication schedules etc for proper running of the plant.

PAM 4 MANUFACTURE, SUPPLY AND TESTING OF STEEL PIPES

PAM 4.1. Scope

This specification covers the manufacture and supply of bare, electric welded low carbon steel pipes and steel pipe special items for the conveyance of water at ambient temperatures and at medium pressures.

PAM 4.2. Standards

Pipes and specials shall be manufactured, tested and inspected in accordance with the latest issues of the following standard specifications unless amended in subsequent clauses in this specification.

a) Pipes

SABS 719: Steel Grades A, B and C
SABS 1431: Steel Grades 300 WA
API 5L: Steel Grades x46, x56 and x60

b) Specials

Specials of 150 mm nominal diameters and smaller to be manufactured with pipe conforming to ASTM Schedule 40.
Specials larger than 150 mm nominal diameter shall be manufactured from pipes complying with this specification.

The radiographic technique, adjudication of radiographs and repair of defects shall be in accordance with API 1104.

c) Qualifications of Welders

All manual or semi-automatic welds and repair welds shall only be undertaken by welder's qualified under the tests laid down in accordance with API 1104

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



d) Non-destructive Tests and Adjudication

- Radiographic inspection: API 1104
- Ultrasonic inspection: API 5L

e) In this Specification reference is made to the latest issues of the following specifications.

SABS 719
API 5L
API 1104
ASME Section V
BS 2971
BS 2633

PAM 4.3. Stresses

All pipes shall be hydrostatically tested as described in PLN 6.5 to a pressure such as to produce a circumferential tensile stress in the steel of not less than 90% of the minimum yield stress.

The design stress for pipes subjected to the specified design pressures shall be 60% of minimum yield stress of the steel.

PAM 4.4. Process of manufacture for pipes

Pipes shall be manufactured by an approved semi-automatic submerged-arc welding process or shall be electric resistance welded. Where semi-automatic submerged-arc welding is employed, at least one pass shall be made on the inside and at least one pass on the outside. The number of longitudinal weld seams shall not exceed:

- a) one seam for pipes up to 1 000 mm nominal diameter
- b) two seams for pipes larger than 1 000 mm and up to 2 000 mm nominal diameter

Circumferential welds by semi-automatic submerged-arc welding method for factory double jointed pipes shall have at least one pass on the inside and at least one pass on the outside.

Welds

SABS 719, BS 2971 and BS 2633 shall generally apply.

For fusion welded pipes and specials, the internal weld bead shall not protrude more than 1 mm into the bore of the pipe or special.

For electric resistance welded pipes, the height of upset metal and flash on the inner surface shall not exceed 1,0 mm.

For pipes to be joined by butt welding, the internal weld bead shall be ground flush with the pipe body for a length of 200 mm from ends to be jointed.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



For pipes to be coupled by flexible couplings, external weld reinforcement or upset metal and flash shall be ground flush with the pipe body for a length of 200 mm from the end to be coupled.

PAM 4.5. Dimensional requirements

- **Pipes**

All dimensions will be in accordance with SABS 719 clause 4.

- **Specials**

The tolerances on specials will be in accordance with BS 534, Section 4.

PAM 4.6. Testing and inspection at manufacturer's works and at site

PAM 4.6.1. General

Factory and Site inspection, supervision of tests and adjudication of test records shall be carried out by an independent Inspectorate.

Tests and inspections shall be carried out at the manufacturer's work at the expense of the Contractor who shall provide all necessary testing facilities, labor, instruments, equipment and samples that might be required, free of charge. The Inspectorate shall be afforded every facility during the course of manufacture and testing to enable the inspection to be carried out effectively.

All test samples shall be selected by the appointed Inspectors and all instruments used for testing purposes shall be approved by the Inspectors and if in the opinion of the Inspectors any instrument should require calibration, such instruments shall be calibrated at the expense of the Contractor by the SABS or such other body as may be approved by the Inspectorate.

No mechanical working or straining of pipes and specials shall be allowed after testing and inspection.

PAM 4.6.2. Visual inspection

All finished pipes and specials shall be visually examined and shall be free of injurious defects as defined in API 5L Section 10.7.

PAM 4.6.3. Non-destructive Inspection

Ultrasonic inspection

Pipes shall be made by an approved welding process and 100 percent of all longitudinal or spiral welds on straight pipes shall be checked with an approved ultrasonic method capable of continuous and uninterrupted inspection of the weld seam in accordance with API 5L Section 9.10, 9.11 and 9.12 except that the equipment shall be checked with an applicable reference standard at least twice every working turn.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAM 4.6.4. Radiographic inspection**

a) Longitudinal Weld Pipe

All electric fusion welded pipes, shall be inspected by radiological methods for a distance of 200 mm from each pipe end.

b) Spiral Weld Pipe

All electric fusion welded pipes shall be inspected by radiological methods for a distance of 100 mm from each end of each length of pipe and of the complete "H" at all scalp and welds including 150 mm of the spiral welds in both directions away from the intersection points with the scalp and welds.

c) Circumferential Butt Welds

100 percent of the length of circumferential butt welds shall be examined provided, when consistently acceptable results are obtained, the number of welds to be so tested may be reduced by mutual agreement between the Engineer, the Inspectorate and the Contractor.

d) Specials

100 percent of all manual or semi-automatic welds in specials shall be examined radio graphically provided, when consistently acceptable results are obtained, the number of welds to be so tested may be reduced.

Where specials cannot be hydrostatically tested, all welds shall be liquid penetrate tested as per ASME Section V.

e) Repairs

Straight Piping:

100 percent of the total length of all repairs shall be examined radio graphically provided, that where repairs are made before ultrasonic inspection and such repairs pass ultrasonic inspection, no further radiographic inspection of same is required.

Pipes for Rail, Road and River Crossing 100 percent of the total length of all welds shall be examined radio graphically.

PAM 4.6.5. Hydrostatic testing

- a) Each individual straight pipe shall be subjected to a hidrostatic test in accordance with the methods described in API 5L, Section 5. Test pressures shall be such as to produce tensile fiber stresses in the pipe wall of not less than 90% of the minimum specified yield strength of steel or shall be 9 MPa whichever is the lesser. Leaks or sweats shall be considered injurious defects.

- b) Should it not be possible to hydrostatically test straight piping and/or specials the through liquid penetrate test as per ASME Section V shall be done on all welds over and above the non-destructive tests specified above. This shall only be applicable with the prior written approval of the Engineer.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAM 4.6.6. Repair of Injurious Defects**

Injurious defects found by non-destructive testing of welds, visual examination, hydrostatic testing or determined by any other means to exceed the limitations in API 5L, Section 10.7 shall be repaired in accordance with API 5L Section 10.8 and 10.9 but subject always to the requirements of this specification.

PAM 4.6.7. Destructive testing

The following destructive tests shall be performed in accordance with SABS 719 clause 7.2 on the first pipe and thereafter on one pipe every 500 subsequent pipes.

- a) Transverse Tensile Test
- b) Root Bent Test (Electric Fusion Welds)
- c) Flattening Test (Electric Resistance Welds)

PAM 4.6.8. Sampling for Destructive Tests

- a) First Sample

A section long enough to provide all the test specimens and material shall be cut from the selected pipe.

- b) Second Sample

If the test specimens and material from the first selected pipe fail to pass any of the tests, a section long enough to provide the appropriate specimens for the test failed by the first sample shall be cut from two further pipes.

- c) Third Sample

If the test specimen from the second sample fails to pass the test(s) a similar section shall be cut from each of a further ten pipes.

- d) Compliance

The piping shall be considered as complying with the specification if after testing of the first or the second or the third sample no defect is found.

PAM 4.7. Flanges

- a) Material – shall be steel plates to conform to the requirements of SABS 1123.
- b) Dimensions – shall be in accordance with SABS 1123 unless otherwise specified in the Schedule of Quantities or on the drawings.
- c) Type – all flanges shall be of the steel-plate for welding type and shall have flat joint faces unless otherwise specified in the Schedule or Quantities or on the drawings.
- d) Finish – joint surfaces shall be in accordance with SABS 1123 clause 4.5.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- e) All flanges shall be supplied complete with bolts, nuts and washers of a material to conform to the requirements of SABS 1123 where applicable, otherwise to the requirements of the Engineer.
- f) Gaskets for flanges joint shall be of compressed asbestos fiber to BS 2815 Grade A and full faced, unless otherwise specified in the Project Specification, with a minimum thickness of 3 mm.

PAM 4.8. Flexible coupling

Flexible couplings shall be of the Viking Johnson or Klamflex type with center register except where specified to the contrary in the Schedule of Quantities or on the drawings. Couplings must be able to withstand hydrostatic test pressures of 1.5 times the specified design pressures and coupling flanges must be designed to withstand all stresses due to tightening of the bolts. Rubber rings shall generally comply with SABS 974 Class F. The internal face of the sleeve section of each coupling shall be grit blasted to SIS 055900 Grade Sa3 finish with an anchor pattern profile not exceeding 75 micrometers in depth as determined by micrometer gauge or portable microscope fitted with a calibrated focusing knob. Within four hours of grit blasting provided surfaces are kept dry and clean, one coat of an approved epoxy resin, Copon or similar shall be spray applied, followed by further coats to a dry film thickness of not less than 300 micrometers over the average profile peak. All other surfaces of coupling components shall be grit-blasted to the same minimum finish and shall receive one coat of an approved protective paint which shall be compatible with materials to be used for the exterior molding of the coupling in the field. Flexible couplings shall be supplied complete with all necessary bolts, nuts and rubber jointing rings.

PAM 4.9. Marking of pipes

All pipes and specials shall be clearly hand stamped alongside a longitudinal or spiral weld on one end of the pipe with the following.

- a) Grade and thickness of steel
- b) Serial number of the pipe or specials
- c) Nominal diameter
- d) Hydraulic tests pressure

PAM 4.10. ANCILLARY EQUIPMENT

Details of spares and special tools are to be listed in the Data Sheet.

The Mechanical Contractor will be responsible for the supply, delivery to site and erection of all ancillary equipment, in the form of holding down bolts, rawl-bolts, pipe clips, small pipes, grease piping etc. to complete the Mechanical Contract.

The Mechanical Contractor will also be responsible to compile a manual in which all the relevant mechanical equipment is described together with the routine maintenance, lubrication schedules etc for proper running of the plant.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAM 4.11. Corrosion protection****PAM 4.11.1. Scope**

This section includes the corrosion protection and materials required for this Contract.

PAM 4.11.2. General

The Contractor shall ensure that he has available the latest edition of all the relevant National Specifications and Codes of Practice and the manufacturer's data sheets for materials to be used.

All paints in a paint system shall be purchased from the same manufacturer.

The Contractor shall submit in the Appendices to the document, details of the paints he intends using and shall only proceed with purchase of the paints upon receipt of written approval from the Engineer. Manufacturer's data sheet or legible copies thereof for each product shall be attached to the Appendices.

Materials and procedures shall comply with the appropriate SABS Specifications and Codes of Practice when relevant.

Strict attention shall be paid to fettling of surfaces by the Fabricator (see Clause PZA 4) prior to coating. Surface preparation requirements, the need for strict cleanliness and adherence to specification requirements especially with regards to over coating times are emphasized.

Areas which are inaccessible after assembly shall be prepared and fully coated with the specified system and to the specified requirements before assembly. The coating shall be fully hard dry before assembly.

Mating surfaces shall be coated with primer of first coat only. The coating shall be uniform in thickness and shall not interfere with the mechanical tolerances. After assembly the outside surface of the joint shall be fully coated.

The painting sub-contractor shall provide evidence of his competence to apply the specified materials in the specified manner and to apply the necessary Quality Control procedures. The Engineer, at his discretion, may demand a Quality Audit of the Contractor's facilities by a technically competent and independent organization (See Clause PZA 10).

The Contractor shall provide a Quality Plan to show the stages at which Quality Control will be carried out. Further details are given in Clause PZA 10. The Quality Plan is subjected to approval by the Engineer, who may require it to be revised if considered inadequate.

The Engineer will require a Program of Work so that Quality Surveillance inspection can be planned and executed at the appropriate time according to the Contractor's program (see Clause PZA 10).

The Contractor shall provide to material suppliers descriptions of materials to be used and shall receive from them a written assurance that the materials to be supplied with the requirements specified.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAM 4.11.3. Design****PAM 4.11.3.1 General**

All items shall be designed to minimize corrosion in exposed environments, under immersion conditions and in interior corrosive situations such as in chlorination rooms. The following notes may be used as guidelines.

PAM 4.11.3.2 Water Retention Areas

Avoid water retention areas wherever possible. For example, angle or U section steel should be used with the toes pointing downwards. The concrete base of steel columns should be sloped away from the steel and the sloping edge should be painted to avoid water ingress at the steel/concrete interface.

PAM 4.11.3.3 Crevices

Crevice give rise to accelerated corrosion by forming an oxygen concentration cell. Crevice may be avoided by using:

- i continuous welding, not space welding
- ii mastics or sealants to seal unavoidable crevices such as bolted connections
- iii insertion rubber or suitable plastic between mating surfaces (See also Clause PZA 2.7).

PAM 4.11.3.4 Bimetallic Couples

Electrical contact between dissimilar metals gives rise to a corrosion cell when an electrolyte such as water is present. Junctions between dissimilar metals shall be insulated.

PAM 4.11.3.5 Accessibility

Whenever possible, the surface of corrodible materials such as mild steel shall be accessible for maintenance. The use of back-to-back angles, partially open box sections or inaccessible stiffeners shall be avoided.

PAM 4.11.3.6 Differential Aeration

Posts buried in soil are subjected to accelerated corrosion to differential aeration. Additional protection shall be given to that part which is buried and up to at least 100 mm above ground.

PAM 4.11.3.7 Sharp Edges, Weld Spatter and Weld Slag

The designer shall specify that all sharp edges be ground to a radius not less than 2 mm and that all weld spatter and weld slag shall be removed by the Fabricator (see Clause PZA 5).

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAM 4.11.3.8 Hot Dip Galvanizing**

The design of articles to be galvanized shall be referred to the galvanizer (see Clause PZA 8).

PAM 4.11.4. Coating materials

No variation in materials tendered and approved by the Engineer shall be permitted without the approval of the Engineer in writing.

Correct material selection shall be confirmed by the material supplier (see Clause PZA 12.1).

All coating materials shall be delivered in the manufacturer's original sealed containers, clearly marked with the following:

Manufacturer's name.

Product Brand and Reference Number.

Batch Number which may incorporate the date of manufacture.

Date of manufacture, unless already incorporated in the batch number.

Abbreviated instructions for storage and use of the material, which shall include mixing ratios of components of multi-component materials, minimum temperature of application and method of application.

The SABS mark where applicable.

All coating materials shall be kept in an approved store, which shall be dry, enclosed and where the temperature is unlikely to exceed 40C or drop below 0 C.

Usage of materials shall be on a first in, first out basis and no materials may be used which have exceeded the shelf life recommended by the manufacturer.

PAM 4.11.5. Fettling or dressing by the fabricator

Before any surface preparation or painting is commenced, dressing shall be carried out to avoid projections, sharp edges, weld slag and spatter that will interfere with the corrosion protection. This includes the following:

Remove all weld flux and weld spatter. Flux is best removed by washing with clean water whilst weld spatter is normally removed by grinding to a smooth surface.

Sharp edges shall be ground to a radius not less than 2 mm.

Welds shall be continuous and shall have a smooth contour. Rough welds shall be ground where necessary to achieve the required smooth profile. Discontinuous welds shall not be permitted except by written approval of the Engineer. Undercuts are not permitted and shall be re-welded and ground where necessary.

Articles for hot dip galvanizing shall not contain overlap joints. Closed sections shall be suitably vented. See Clause PZA 8 (Hot dipped Galvanizing).

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PAM 4.11.6. Surface preparation for painting****PAM 4.11.6.1 Mild Steel**

Oil and grease contamination, when present, shall be removed by degreasing before blast cleaning.

Mild steel shall be blast cleaned in accordance with Section 4.3 of SABS 064 Code of Practice for "The preparation of steel surfaces for coating".

An additional requirement is that water soluble salts present in the steel after blast cleaning shall not exceed the value given in Table 1. Should these values be exceeded, the steel shall be cleaned by washing with clean potable water or by water shrouded or water injected blast cleaning until the soluble salts are within the limits specified in Table 1. The steel shall then be allowed to dry, after which it shall be flash blast cleaned to achieve the required degree of cleanliness.

PAM 4.11.6.2 Cast Iron and Cast Alloys

All cast surfaces shall be blast cleaned with new iron slag, copper slag, or platinum slag abrasives designed for blast cleaning. The abrasive shall not be recycled or re-used. Cast iron shall be blast cleaned until all sand particles, residual burst on sand and casting skin have been completely removed. This blast cleaning shall be carried out by the Foundry prior to dispatch to the galvanizer or painting contractor, when relevant. Conventional cleaning of castings is inadequate for galvanizing.

PAM 4.11.6.3 Galvanized Steel Surfaces

Galvanized steel surfaces shall be thoroughly degreased prior to painting, using either a water risible solvent degreaser used in accordance with the manufacturer's instructions, or a mild acid-detergent degreasing solution. In both cases care shall be taken to avoid entrapment of cleaning agent in recesses or other retention areas and in both cases the surfaces shall be thoroughly washed until a "water break free" surface is achieved. If necessary, the process shall be repeated until a "water break free" surface is obtained.

A water break free surface is one which, when wetted all over with potable water, maintains a continuously wet surface and the water does not break up into islands of un-wetted surface.

TABLE 1 – STANDARDS FOR BLAST CLEANING REQUIRED

Property	Above Water	Immersed Surface	Tape Wrapping
Cleanliness to SIS 06 5900 (min)	Sa2½	Sa3	Sa2
Residual dust and debris	0,5%	0,3%	1%
Oil grease and perspiration	Nil	Nil	Nil
Surface Profile min (micrometers)	25 50	50 10	50 100
Water soluble iron salts maximum at any point	500 mg/m2	100 mg/m2	500 mg/m2
Average of any 250 cm	100 mg/m2	100 mg/m2	100 mg/m2

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



After degreasing, the surface shall be lightly abraded by one of the following methods:

On small areas by the use of abrasive paper not coarser than 120 grade, or by using non-metallic abrasive pads.

On large areas by "sweep blast cleaning", using a nozzle pressure not greater than 300 kPa and a very fine abrasive. Cracking, flaking, or any form of delamination of the zinc coating due to excessive blast cleaning shall not be permitted. Removal of zinc by blast cleaning shall not exceed 10 micrometers.

Finally, all dust and debris shall be removed by vacuum cleaning, or by washing, and the surface shall be allowed to dry before coating.

PAM 4.11.6.4 Aluminium

Generally, aluminium surfaces will be anodized or powder coated and will require no further treatment. Where painting is required, the aluminium surface shall be thoroughly degreased, then rinsed with clean potable water. If the surface is not "water break free", repeat the degreasing process until a water break free surface is obtained. Allow to dry completely, then apply a thin coat (8 to 13 micrometers dry film thickness) of wash primer complying with SABS 723, mixed and applied in accordance with the manufacturer's instructions.

NOTE: Wash primer is an adhesion promoter and does not replace the primer specified in the paint system.

PAM 4.11.6.5 Stainless Steel

Components fabricated from stainless steel shall not be contaminated with iron or mild steel. Sheared edges, welds or surfaces subjected to any form of heat treatment shall be picked and passivated. Stainless steel surfaces shall not be scratched or stressed.

When it is required to paint stainless steel, the surface shall be blast cleaned with non-metallic abrasive such as iron slag, copper slag or platinum slag. The use of steel shot, steel grit or cast iron is strictly prohibited. Any contamination with iron or mild steel is prohibited.

Where blasting is impractical, the surface shall be cleaned with detergent solution and roughened manually by using non-metallic abrasive pads, followed by washing with clean potable water to a "water break free" surface. If a "water break free" surface is not obtained, detergent cleaning shall be repeated until the surface is "water break free". Allow the surface to dry before coating.

PAM 4.11.7. Painted surfaces

PAM 4.11.7.1 Fully painted surfaces to be repaired

Bare areas shall be cleaned with abrasive paper not coarser than 220 mesh to bright metal surface. The surrounding paint, which must be intact, shall be feathered for a distance of 20 mm beyond the damaged areas. Dust and debris shall be removed by the use of a clean rag dampened with water or clean solvent that will not attack the coating. The damaged area shall be allowed to dry, after which spot repair shall be carried out with all the coats previously applied and shall overlap the undamaged area by 20 mm.

The requirements of the spot repair shall be not less than that specified for the undamaged coating.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



When additional coats are required over the whole surface, the whole surface shall be abraded to a uniform matt finish, dust and debris removed, and the surface allowed to dry. All further coats shall then be applied as specified to give a uniform finish. Note that abrasion of the coating is not required for vinyl systems.

PAM 4.11.7.2 Fully painted surfaces to be over coated

Where additional coats are required over the whole surface, the surface shall be degreased and abraded to a uniform matt finish. The surface shall be washed to remove all contamination and then allowed to dry. Further coats shall then be applied as specified to give the required coating thickness and specified finish.

PAM 4.11.7.3 Primed surfaces

Shop applied primers shall be thoroughly sanded with fine abrasive paper to achieve a uniform matt surface, then scrubbed with a solution of suitable water-based detergent-degreaser using a bristle brush, followed by clean water rinses to remove all grease and water-soluble matter. The surface shall be allowed to dry completely before application of the specified coating system over the whole surface.

PAM 4.11.7.4 Plastic Surface such as u-PVC and Polyester GRP

Sand the surface thoroughly with fine abrasive paper to achieve a uniform matt finish. Remove all debris, oil and grease by scrubbing with a solution of a suitable water-based detergent such as Shell Teepol Lensex. Allow to react for 15 to 30 minutes, then rinse off very thoroughly with clean potable water to remove all residues. Allow to dry completely before painting.

PAM 4.11.8. Application of paints

PAM 4.11.8.1 Environmental Conditions

Paint shall not be applied in dusty conditions, nor when the steel surface temperature is less than 3 C above dew point, or higher than the advised by the paint manufacturer, or when humidity is greater than 85%, nor when the ambient temperature is less than the minimum or greater than the maximum specified by the manufacturer of the coating material.

PAM 4.11.8.2 Mixing

All coating materials shall be very thoroughly mixed until completely homogeneous. In the case of two pack materials, each component containing pigments shall be thoroughly mixed. The two components shall then be mixed together in the proportions supplied by the manufacturer until the mixture is completely homogeneous. In the case of solvent-based epoxy materials, it is recommended that the mixed material be allowed to stand for an induction period of 20 to 30 minutes before use.

For two pack materials, the use of part of the contents (Split packs) is strictly forbidden.

PAM 4.11.8.3 Method of Application

Application shall be by brush, roller, spray, airless spray or other suitable equipment as appropriate for the surface to be coated and in accordance with the recommendations of the manufacturer. Application equipment shall be maintained in clean conditions and in

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



good working order. The use of equipment not maintained in good condition may lead to rejection of the coating.

NOTE: Zinc silicate primers shall be applied by conventional spray, using a continuously agitated pressure pot, unless otherwise recommended in writing by the manufacturer.

PAM 4.11.8.4 Over-Coating

Over-coating times shall be not less than the minimum nor greater than the maximum specified by the manufacturer relevant to the ambient temperature. Strict adherence to over-coating times is particularly important for coatings which are subsequently immersed.

The contractor shall be held responsible for blistering of paint coatings on immersion, when shown to be caused by solvent retention.

All costs shall be clean and free from dust, oil, moisture, perspiration before over-coating. Operators handling blast cleaned or partially painted surface shall wear clean gloves to avoid contamination of the surface.

PAM 4.11.8.5 Manufacturer's Instructions

Recommendations supplied by the manufacturer in the form of the latest edition of printed data sheets, or given in writing on the manufacturer's letterhead, shall be followed. Verbal information by the manufacturer's representative will not be accepted unless confirmed in writing by the company.

PAM 4.11.8.6 Handling

Coated components shall not be handled earlier than the hard dry time recommended by the manufacturer, relevant to the ambient temperature. Coated components shall be handled with broad band slings and suitable packing to minimize damage to the coating. All damage caused in handling, transportation and erection, shall be repaired to the satisfaction of the Engineer at no extra cost.

PAM 4.11.9. Metal coating and corrosion resistant metals

HOT DIP GALVANIZING

Design and Fabrication

Components for hot dip galvanizing shall be designed and fabricated in accordance with the recommendations of SABS Code of Practice Project No. 341/50490 (not published at the time of preparation of his specification), except that the use of lead plugs is not permitted.

It is recommended that the manufacturer consults the galvanizer before design and fabrication to ensure that the fabrication will be suitable of galvanizing.

The main requirements are as follows:

Overlap joints shall be avoided wherever possible. If essential, such overlap joints shall be thoroughly degreased before assembly and shall be vented by drilling holes through one or both overlapping materials.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



Closed sections shall be suitably vented. If the inside of a closed section is not to be galvanized, a snorkel vent tube of suitable length and bore shall be attached.

Gussets and internal baffles in tanks shall be cropped to allow free flow of zinc and air.

Joints shall be continuously welded, using balanced welding techniques to avoid stresses. Welds shall be free from cavities, undercutting, weld slag and spatter. Symmetrical design shall be used whenever possible and the use of thin gauge steel adjacent to heavy sections shall be avoided.

Openings and flanges of manholes and bosses shall finish flush on the inside to ensure complete drainage.

Castings shall be designed to be of as uniform section as possible and shall be blast cleaned in accordance with Clause PZA 6.2 before dispatch to the galvanizer. The Hot Dip Galvanizing Process

Hot dip galvanizing shall comply with SABS 763 for fabricated articles, SABS 934 for pre-galvanized sheet, or SABS 935 for wire.

Mating surface on fabricated or cast-iron components shall be wiped or centrifuged on removal from the galvanizing bath to remove blobs, runs or excess metal that may impair the air/gas/water tightness of the joint.

Bolts, nuts and washers used for fixing shall be hot dip galvanized to SABS 763. Electroplated fasteners will not be accepted unless otherwise agreed by the Engineer in writing.

Repair of Galvanized Articles

Welding, flame cutting, or other heat processes shall not be carried out on galvanized articles unless permission is granted by the Engineer in writing.

If such permission is given, or if mechanical damage has occurred, repair shall be carried out as follows:

All scale, spatter and flux shall be removed by grinding and washing with clean water. Edges shall be ground to a radius not less than 2 mm.

The preferred repair process is to blast clean the bare steel and apply zinc by the thermal spray process in accordance with SABS 1391 Part 1, Grade Zn 150. On completion of metal spraying, burnish the surface by means of a mechanical wire brush to give a uniform appearance. Such burnishing shall remove not more than 10 micrometers of zinc. Where small areas are to be repaired, clean the surface thoroughly with fine abrasive paper, remove all debris with a damp cloth and allow to dry. Apply an approved one pack epoxy ester-based zinc rich primer containing not less than 90% by mass of zinc in the dry film. A sufficient number of coats (usually 3 or 4) shall be applied such that the repair coating thickness is not less than the average zinc thickness specified in SABS 763, 934 or 935, as appropriate. The repair shall extend not less than 5 mm beyond the damaged area.

On completion of the repair and when the zinc primer is completely dry, one coat of alkyd resin aluminium paint may be applied to obtain a uniform appearance.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



NOTE: Repair of galvanized surfaces by application of aluminium paint alone IS NOT PERMITTED.

Storage of Galvanized Components

Galvanized components shall be stored to avoid the formation of “white rust” or other forms of storage staining.

Components shall be separated and supported on wooden battens to ensure adequate ventilation of all surfaces and in such a manner to avoid “ponding” by rainwater.

If storage staining does occur, remove the stains by scrubbing with detergent solution and bristle brush or nylon pad. The use of steel wool or other metallic abrasive is not permitted. Rinse thoroughly and allow to dry. If the residual zinc thickness complies with the requirements of the appropriate grade in the relevant specification, no further action is required unless instructed by the Engineer.

If the zinc thickness is below specification, the article shall be re-galvanized or repaired in accordance with Clause PZA 8.3 as instructed by the Engineer.

PAM 4.11.10. Stainless steel fabrications

Grade and Welding Techniques

The grade of stainless steel to be used shall be as specified in the appropriate section of the mechanical specification or drawing. Where welding is necessary, the appropriate “L” (low carbon content) shall be used. Plate shall be supplied as No 1 Finish in accordance with BS 1449 Part 4.

Welding procedures shall be only those recommended by the stainless-steel manufacturer or by the South African Stainless Steel Development Association. Only welders coded to BS 4870 Part 1 or to ASME IX, 1983 shall be employed.

Welds shall be smooth and free from blowholes, undercuts, sharp projections and similar visual defects.

Fabrication of stainless-steel components shall be carried out in clean work places where there is no contamination by mild steel. Grinding and polishing equipment shall be dedicated and shall not be contaminated with iron or mild steel.

Stainless steel shall be suitably handled to avoid scratching the surface.

Pickling and Passivation

Cut edges, welds and heat-treated surfaces shall be pickled and passivated to remove all discoloration. Proprietary pickling and passivating pastes (as supplied by Duva Chemicals (Pty) Ltd., or other approved supplier) shall be used in accordance with the manufacturer’s recommendations. Care shall be taken not to exceed the maximum contact time recommended.

The safety precautions given in PZA 10.2 shall be strictly observed.

After passivation, surfaces shall be very thoroughly washed with clean potable water to remove all traces of acid. The surface shall be allowed to dry, then polished where

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



necessary, using polishing compounds recommended by the stainless-steel manufacturer or the South African Stainless Steel Development Association. SAFETY PRECAUTIONS as specified in Clause PZA 10.1 (ii) shall be strictly observed.

PAM 4.11.11. Corrosion Resistant Steel 3cr12

Welding Techniques

Welds shall be full penetration welds, using 309 austenitic electrodes of filler wire, or as recommended by the manufacturers (Middelburg Steel & Alloys (Pty) Ltd).

Welders shall be suitably coded for welding similar thickness of austenitic stainless steel, in accordance with BS 4870 Part 1 or ASME IX, 1983.

Welding procedures shall comply with the recommendations of the manufacturers of 3CR12 (Middelburg steel & Alloy (Pty) Ltd).

Welds shall be smooth and free from blow holes, undercuts, sharp projections and similar visual defects.

Pickling and Passivation

After completion of welding, both weld and heat affected zones shall be cleaned, pickled and passivated. Any heat scale on the steel shall be pickled and passivated.

The procedure shall be as follows:

Not to painted surfaces

Grind or wire brush, using dedicated grinders or stainless-steel wire brushes to achieve the required smooth profile or remove scale.

Pickle with a thixotropic paste containing 15-20% nitric acid and 1-2% hydrofluoric acid, with a contact time of 15 to 10 minutes.

Rinse thoroughly with clean water until the pH of the washings is the same as that of the wash water.

Repeat the above process, if necessary to remove all discoloration.

Passivate with 10% nitric acid solution, or a proprietary passivating paste, for a contact time of 10-15 minutes, keeping the surface wet during this period.

Rinse thoroughly with clean potable water until washings are the same pH as the wash water.

Operatives shall wear protective aprons, gloves and safety glasses during pickling and passivating operations.

Splashes on the skin shall be thoroughly washed with clean water immediately after contact. A weak solution of sodium bicarbonate shall be kept available for neutralization. Seek medical attention if in doubt.

Disposal of effluent shall be in accordance with the requirements of the local authority in whose area the work is being carried out. Generally, the effluent is stored in drums containing an excess of lime (calcium carbonate).

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAM 4.11.12. Aluminium**

- **Anodizing**

Aluminium components where specified as anodized shall be natural anodized and sealed in accordance with SABS 999 Grade 25. The corrosion resistance of the coating shall be not less than 8 when tested in accordance with 3.6 of specification SABS 999. Anodising shall be carried out after completion of all welding.

- **Powder Coating**

When specified by the Engineer, aluminium handrails may be coated with polyurethane powder. Such coating shall only be carried out by Contractors with the necessary plant, equipment and experience to pre-treat and power coat aluminium effectively. The coating shall comply with BS6496, 1984.

- **Fixing**

Whenever aluminium components, such as stop log frames, come into contact with concrete or grout, the surface of the aluminium in contact with concrete shall be coated with two coats of an approved epoxy tar composition.

PAM 4.12. Quality assurance requirements**PAM 4.12.1. Contractor Qualification**

The Tenderer shall state in the Appendix to his document the name of the painting sub-contractor that he proposes to use to carry out the painting or coating. The Engineer may, at his discretion, require a Quality Audit of the painting sub-contractor to ensure that he has the management, facilities, skilled staff, and quality control facilities and staff to carry out quality control during application of coatings to ensure compliance with the specification.

The contractor shall accept full responsibility for the quality of his work and of materials used, irrespective of any quality surveillance that may be carried out by the Engineer or his representative.

The contractor shall obtain confirmation from the material supplier that materials to be used comply with the specification and are suitable for the intended purpose by having the appropriate Appendix completed by the material supplier.

PAM 4.12.2. Quality Control

The contractor shall have the necessary equipment and staff knowledgeable in test procedures to carry out all the quality control required to ensure compliance with the specification. The contractor will be required to produce a quality plan and a program for carrying out the work. The contractor shall maintain quality control records of all stages of the work, batch numbers of materials used, environmental conditions, all as required by the specification. Quality control shall be inclusive in the contractor's tender price.

PAM 4.12.3. Quality Surveillance

Independent surveillance – The Engineer may employ an independent technically of the work on his behalf.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Program – The Contractor shall advise the Engineer timeously, in writing, when and where the following processes will be carried out:

- (i) Completion of fettling or dressing prior to leaving the fabricator's works.
- (ii) Blast cleaning and application of the first or prime coat.
- (iii) After completion of all coats to be applied at the contractor's works.
- (iv) At the commencement of repairs to be carried out on site.

Failure of the Contractor to advise the Engineer of his program may result in rejection of the work.

PAM 4.12.4. Access for Surveillance

For the purpose of carrying out quality surveillance, the Engineer or his representative shall be granted access to any part of the Contractor's premises relevant to the work being carried out, at any reasonable time. The Contractor shall provide, at his own cost, any equipment or labour necessary to gain access to surfaces which are coated, to be coated or are in the process of being coated.

PAM 4.12.5. Samples

The Engineer or his representative may remove any reasonable samples of materials to be used in the coating application. Rejection of the sample will place a hold on the use of material of the same batch number and may lead to rejection of all that batch of material and the reworking of any components that have already been coated with rejected material.

PAM 4.12.6. Destructive Testing

The Engineer or his representative may carry out reasonable destructive tests to ascertain compliance with the specification. Areas thus damaged shall be repaired by the contractor to the satisfaction of the Engineer at no additional cost.

PAM 4.12.7. Cost of Quality Surveillance

Cost of Quality Surveillance shall be borne by the Employer, except when surveillance results in rejection of the lot or when notice by the Contractor results in a fruitless strip, in which cases the cost shall be debited against the contractor's account.

PAM 4.12.8. Quality Control Records

Proper and adequate quality control records shall be maintained by the Contractor for all stages of the work. These records shall be available for inspection by the Engineer or his representative at the time of Quality Surveillance. Incomplete, inaccurate or inadequate records shall be regarded as non-compliance with the specification, and the cost of surveillance will be back charged to the contractor.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PAM 4.12.9. Data Sheets, Specifications, and Codes of Practice

The contractor shall have available the latest issues of manufacturer's data sheets materials to be used, National specifications and Codes of Practice relevant to the work to be carried out, as well as a copy of his specification, all of which shall be available to the Contractor's Quality Control Manager.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAE ELECTRICAL PARTICULAR SPECIFICATION****PAE 1 GENERAL TECHNICAL REQUIREMENTS FOR THE EXECUTION OF THE ELECTRICAL WORKS (MATERIALS)**

PAE 1.1. STANDARDS

PAE 1.2. SYSTEM AND SITE CONDITIONS

PAE 1.3. LAWS, REGULATIONS AND CODES OF PRACTICE TO BE OBSERVED

PAE 1.4. RADIO AND TV INTERFERENCE

PAE 1.5. PROTECTION OF EQUIPMENT AGAINST VOLTAGE SURGES AND SPIKES

PAE 1.6. DRAWINGS

PAE 1.7. DRAWING SYMBOLS AND LETTERING

PAE 1.8. SPECIFIC REQUIREMENTS FOR SINGLE LINE DIAGRAM

PAE 1.9. SPECIFIC REQUIREMENTS FOR SCHEMATIC DIAGRAM

PAE 1.10. OPERATING MANUALS

PAE 1.11. 11ROUTE PLANS TO BE SUBMITTED BY THE CONTRACTOR

PAE 1.12. INTERCHANGEABILITY

PAE 1.13. WATER AND DEBRIS ACCUMULATION

PAE 1.14. 1NAME TAGS

PAE 1.15. FASTENERS

PAE 1.16. COLOUR AND FINISHING

PAE 1.17. INSPECTIONS AND TESTS

PAE 1.18. PERFORMANCE TESTS

PAE 1.19. DEFECTS LIABILITY PERIOD

PAE 1.20. SPARES

PAE 1.21. LOW VOLTAGE ELECTRIC MOTORS

PAE 1.22. ELECTRICAL ACTUATORS FOR VALVE CONTROL.

PAE 1.23. MULTICORE CABLES AND EARTHWIRES

PAE 1.24. JOINTING OF CABLES

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PAE 1.25. TERMINATION OF MULTICORE CABLES

PAE 1.26. DISTRIBUTION AND MOTOR CONTROL BOARDS

PAE 1.27. CONCRETE PLINTH FOR STARTER PANELS AND PEDESTALS

PAE 1.28. ELECTRONIC LEVEL CONTROL

PAE 1.29. EMERGENCY STOP PUSH BUTTONS AND WEATHERPROOF ISOLATORS

PAE 1.30. CABLE LADDERS

PAE 1.31. LIGHTNING PROTECTION

PAE 1.32. EARTH CLAMPS

PAE 1.33. UNDERGROUND CABLE SLEEVES

PAE 1.34. NOTICES AND DANGER PLATES

PAE 1.35. ROTATING BRIDGE BRUSH GEAR

PAE 2 GENERAL TECHNICAL REQUIREMENTS FOR THE EXECUTION OF THE ELECTRICAL WORKS (CONSTRUCTION)

PAE 2.1. INSTALLATION OF MULTICORE CABLES

PAE 2.2. PLUGGING OF BRICK WALLS AND CONCRETE

PAE 2.3. INSTALLATION OF DISTRIBUTION BOARDS AND MOTOR CONTROL BOARDS

PAE 2.4. EARTHING

PAE 2.5. BALANCING OF LOAD

PAE 2.6. NAME PLATES

PAE 3 PRELIMINARY MCC SPECIFICATIONS

PAE 4 PRELIMINARY LOAD LIST SPECIFICATIONS

PAE 5 PRELIMINARY MOTOR LIST SPECIFICATIONS

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PAE 1 GENERAL TECHNICAL REQUIREMENTS FOR THE EXECUTION OF THE ELECTRICAL WORKS (MATERIALS)

PAE 1.1. Standards

All materials and equipment to be supplied and installed under this contract shall be new and of the best quality available.

All materials and equipment shall comply with the requirements laid down in the latest editions of the BS, SABS and IEC specifications and their amendments (if any) as well as those laid down in this specification. Where items bearing the SABS mark, are available for any of the materials and equipment specified, only materials bearing the said mark, will be acceptable.

The following Standard Specifications and drawings shall apply:

SABS 780	-	Distribution Transformers
SABS 555	-	Transformer oil
SABS 833	-	Bushings
SABS 97	-	Medium voltage cables
SABS 763	-	Galvanizing
SABS 0142	-	Code of Practice for the wiring of Premises
BS 923	-	Testing
BS 2631	-	Switch gear
BS 162	-	Switch gear
BS 159	-	Bus bars
SABS 1091	-	Paint colour
BS 3938	-	Current Transformers
BS 3941	-	Potential Transformers
BS 89	-	Ammeters
BS 638	-	Welding cables
SABS 1507	-	Electrical cables with extruded solid dielectric insulation for fixed Installations (300/500V to 1900/3300V)
SABS 256	-	Moulded Case Circuit Breakers
SABS 767	-	Earth leakage protection units
SABS 1084	-	Cover plates for wall outlet boxes
SABS 1085	-	Wall boxes for the enclosure of electrical accessories
SABS 1065	-	Metal conduit Part 1
SABS 1065	-	Metal fittings Part 2
SABS 1574	-	Electric cables and flexible cords
SABS 163	-	Wall and appliance switches
SABS 1119	-	Ballasts for fluorescent lamps
SABS 890	-	Fluorescent lamp reference ballasts
SABS 086	-	Interior luminaries for fluorescent lamps
SABS 1029	-	Miniature substation
SABS 1152	-	Metal working chisels for hand use
BS 3939	-	Graphical symbols for electrical power, telecommunication and Electric Diagrams
BS 148	-	Specification for unused mineral insulating oils for transformers and switch Gear.
BS 142	-	Electrical Protection relays
BS 1650	-	Specification for capacitors for connection to power – frequency System.
BS 4504	-	Circular flanges for pipes, valves and fittings (PN Designated)

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**PAE 1.2. System and site conditions**

All materials and equipment supplied under this contract shall be suitable for operation under the following conditions unless specifically specified otherwise elsewhere in this document:

Low voltage system: 400/230V, 50 Hz, 3 phase, 4 wire, alternating current with solidly earth neutral.

Atmosphere: Dry, dusty, warm and highly corrosive

PAE 1.3. Laws, regulations and codes of practice to be observed

The work shall be carried out strictly in accordance with and all material and equipment supplied shall comply with the following laws and regulations where applicable:

- (a) The latest edition of the "Code of Practice for the Wiring of Premises", SABS 0142, as amended;
- (b) Occupational Health and Safety Act (Act No.85 of 1993);
- (c) The "Electricity Supply By-Laws and Regulations" of the Local Supply Authority;
- (d) The local Fire-Office Regulations;
- (e) The Requirements of the Department of Communications;
- (f) The Acts and Regulations applicable to the use of explosives;
- (g) "The Code of Practice for the Installation and Maintenance of Electrical Equipment used in Explosive Atmospheres" (SABS 086);

The contractor will be responsible for serving all notice and paying all fees due in terms of the above laws regulations.

PAE 1.4. Radio and tv interference

All equipment installed under this Contract shall comply with the Government Notice. R.2246 and any other applicable rules and regulations in respect of radio and TV interferences. Any equipment found producing interference subsequent to commissioning shall be suppressed or replaced to the satisfaction of the Engineer without any additional cost.

PAE 1.5. Protection of equipment against voltage surges and spikes

Tenderers shall allow in their tender prices for adequate protection of the equipment supplied and installed under this Contract against direct as well as induced voltage surges and spikes which may be experienced on the system.

Surge arrestors shall be provided on each phase as well as neutral on the incoming power supply terminals of each board.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Electronic equipment shall be adequately protected on both the incoming and outgoing terminals as well as on both ends of cables leaving and entering a building by means of suitable arrestors compatible with the relevant equipment.

Arrestors shall be of COPA manufacture (as supplied by Surge Technologies (Pty) Ltd.). All arrestors shall be connected to earth along the shortest possible route and only conductors of adequate rating for the discharge currents catered for shall be used for connections to arrestors.

Tenderers shall submit full particulars of the arrestors offered as well as written confirmation that it will provide adequate protection for the relevant equipment against possible voltage surges and spikes on the system.

PAE 1.6. Drawings

PAE 1.6.1. Standard Drawing Sizes

The following standard drawing sizes are preferred.

Electrical Single Line Diagrams	A1 or A2
Electrical Schematic Diagrams	A3
Electrical Wiring Diagrams	A3
Electrical Cable Schedule	A3 or A4
Electrical Connection Schedules	A3 or A4
Electrical Panel General Arrangements	A1, A2 or A3
PLC Hardware Configurations	A2, A3 or A4
Electrical Substation Layouts	A1
Electrical Cable Routing and Racking	A1
Lighting Layout Drawings	A1

A0 drawings are to be avoided due to the difficulty in physically handling the drawing. If an A0 drawing is reduced in size when using Autocad all scales shall be removed and the drawing designated "Not to Scale".

PAE 1.6.2. Document Format

The following defines which documents shall be prepared as "drawings" or which are to be prepared as computer generated schedules:

PAE 1.6.3. Drawings

Electrical Single Line Diagrams
 Electrical Schematic Diagrams
 Electrical Wiring Diagrams
 PLC I/O Schedule
 Electrical Panel General Arrangements
 PLC Hardware Configurations
 Electrical Substation Layouts
 Electrical Cable Routing and Racking
 Lighting Layout Drawings
 Electrical Equipment Lists

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAE 1.6.4. Schedules**

Electrical Cable Schedules
 Electrical Connection Schedules
 PLC I/O Listings (optional as schedule)

Where document is specified as a schedule it shall be prepared as a spread sheet file with field names and lengths as specified.

Drawing Sheets

All drawings shall be drawn on the Employer's drawing sheets unless otherwise approved by the Engineer. Contractors may add their own logos, title blocks and numbers provided that the main title block is the Employer's title block. The requirement shall apply for the following drawings:

- Single line diagrams
- Schematic diagrams
- Equipment schedules

PAE 1.6.5. Drawing Numbers

All drawings shall bear the Project number as the main number. Contractors may add their number as a secondary number in which case the number shall be clearly identified as the contractor's number. This requirement shall apply for the following drawings:

Single line diagrams
 Schematic diagrams
 Equipment schedules

PAE 1.6.6. Equipment Numbering

All electrical equipment shall be numbered using an acceptable equipment numbering system.

Provision shall be made on the drawings to incorporate this number.

PAE 1.6.7. Electronic format

All drawings, schematic diagrams and schedules shall be handed over to the Engineer on Compact Disk on completion of the project.

PAE 1.7. Drawings symbols and lettering**PAE 1.7.1. Drawing Symbols**

All electrical symbols shall be drawn as detailed in the South African Rationalized Specification
 NRS 002 – 1990 Graphical Symbols for Electrical Diagrams.

Symbol sizing shall be according to that specified in the NRS. Electrical symbols shall not be reduced in size to fit into a drawing. Attention shall be paid to the layout to allow for future drawing additions.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Where the NRS 002 – 1990 does not propose a suitable symbol reference shall be made to IEC 617, or a purpose made symbol may be developed. In such case the symbol selected from IEC 617, or created, shall be to the approval of the Engineer.

Lettering Requirements

The following lettering sizes shall be used (dimensions in mm)

Item	A0	A1	A2	A3 & A4
Drawing Number	7	7	7	5
Mark, Item No. View, Section No.	5	5	5	3,5
Title – in the block	3,5	3,5	3,5	2,5
Title under detailed item, info on sections	5	3,5	3,5	2,5
Letters and Figures (Body of Drawings)	3,5	3,5	2,5	2,5
Exponents, Small Letters in SI Units	3,5	2,5	1,8	1,8

PAE 1.8. Specific requirements for single line diagrams

PAE 1.8.1. General Requirements

Single line diagrams shall be updated regularly during the project to include plant additions as and when they occur.

PAE 1.8.2. Pumping Station Overall Single Line Information Requirements

The plant overall single line diagrams shall not be over simplified for the sake of maximizing the amount of information on a single sheet. If necessary, the drawing shall be split into more than one sheet in a logical manner so that information is grouped by plant sections on each of the sheets.

For this purpose, the single line diagrams shall include the following information:

- Protection scheme details
- Cable sizes
- Cable lengths
- Transformer ratings, ratio, vector group and impedance
- Large motor details (typically only MV motors for overall single line diagrams)
- Supply authority substation details including transformer size and impedance

PAE 1.8.3. Drawing layout

The overall single line drawing shall be laid out with the power flow from top to bottom or left to right. The drawing layout should avoid unnecessary crossing of lines.

PAE 1.8.4. Individual Switchboard Single Line Diagrams

These drawings shall be comprehensive in detail and shall, along with the requirements listed for overall single line diagrams, show all the feeder and motor circuits connected to the board, with the following information:

- Rating of all circuit breakers
- Load details including rating and full load current
- Normal running load (calculated) of the incomer circuit(s).

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- d) On the incomer circuit the source of the power shall be specified
- e) Cross reference to the overall single line diagram on which the specific single line diagram appears.

PAE 1.9. Specific requirements for schematic diagrams

Use of Multiple Drawing Sheets on One Drawing Number

Schematic diagrams for a particular plant item e.g., a motor control centre, M.V. switchgear panels or similar shall be drawn under one drawing number with multiple sheets.

The set shall include a cover sheet (Sheet 1) and an index sheet (sheet 2, 3 etc. as required). The index sheet(s) shall list all drawings in the set and shall include the sheet number, drawing title and latest revision for that sheet.

PAE 1.9.1. Drawing information

The information depicted on a single schematic sheet shall be limited to the equipment within a particular panel cubicle. A panel cubicle may extend over more than one sheet but a sheet may not contain more than one panel cubicle's equipment and wiring schematic.

PAE 1.9.2. Grid System

Schematic diagrams shall be drawn on a grid system, columns numbered from 0 to 9 rows numbered from A. to E. Equipment shall be numbered and cross referenced on this grid system.

All n/o and n/c relay contacts and auxiliary contacts on equipment shall be listed in close proximity to the relevant component with cross reference to the specific sheet where that contact is utilized.

PAE 1.9.3. Schematic Diagram Layout

Schematic diagrams shall be laid out with a minimum spacing of 10mm between vertical lines. Components shall be laid out evenly in the horizontal plane with the requirements that relay type devices are drawn at the bottom of the sheet.

The power circuit section shall be drawn on the left of the schematic diagram.

Schematic Diagrams – Medium Voltage Switchgear

Each MV circuit shall have the schematics split over a number of sheeting as follows:

1 st sheet in sequence	ac circuit details including protection and metering
2 nd sheet in sequence	closing circuits
3 rd sheet in sequence	tripping circuits
4 th sheet in sequence	indication and interlocking with external devices

The drawing shall cross reference each other.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAE 1.10. Operating maintenance manuals****PAE 1.10.1. General details**

Separately bound operating manuals and maintenance manuals shall be provided.

Final versions of the operating and maintenance manuals shall contain the following sections:

- Equipment maintenance: Maintenance data
 - Setting and resetting information
 - General technical data including spare parts lists and drawings
 - Fault diagnoses procedures
- Test and Guarantee: Protection test report
Final test report
- Equipment operation: Operating instructions
(Summary version)
Start and stop instructions
- Equipment operation: Operating instruction (detailed version)
- Drawings: All relevant drawings
- Electronic version: Electronic version of all drawings
Electronic copy of PLC programming software

PAE 1.10.2. Quantities

The following quantities of the above manuals shall be provided:

- Originals: 3 (with original brochures)

PAE 1.10.3. Preparation sequence

The above manuals shall be made available in the following sequence:

- Draft version: To be submitted to the Engineer for approval before the beginning of erection.
- Preliminary version: To be submitted when initial commissioning begins.
- Final version: To be submitted when acceptance tests are over.

PAE 1.10.4. Preliminary operating and maintenance manuals

During the commissioning period the Contractor shall submit two draft copies of each of the following, for all equipment supplied, for the Engineer's approval:

- Operating manuals (including technical data, check lists, procedures etc.)
- Maintenance manuals (with schedules of routine and regular maintenance and routine tests of equipment).
- Technical data manuals (including schematic wiring diagrams, particular technical data, adjustments details, reference lists, local agents for supply and repair, spare lists etc.).

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PAE 1.10.5. Preparation of the final manuals

After the Engineer has approved the draft manuals described above, copies of each manual shall be supplied by the Contractor.

These manuals shall be permanently bound in book form, together with "as installed" drawings where applicable, with hard plastic covers able to withstand prolonged and repeated use.

Manuals shall be properly indexed to facilitate quick reference.

Preparation of the final manuals

The abovementioned copies of the final "Operating and Maintenance Instruction Manuals" shall be prepared as follows:

a) Binding

The manuals shall be securely bound in A4 size heavy duty hard backed plastic/waterproof 4 ring binders with clear pockets on the spine and front cover for insertion of title slips giving Contract number, scheme, dam and equipment supplied, etc.

b) Separate plastic pockets

Drawing larger than A3 size, index and other title pages shall be contained in separate pockets.

c) Layout

Each manual shall contain sections separated by subtitle sheets in plastic pockets that are clearly and visibly marked to match the index.

Sections of manual

These various sections of each manual shall be arranged as follows:

- Title page
- Index
- Final acceptance certificate relating to tests carried out
- Operating instructions: These should be clear, concise and easy to follow and must include where applicable pre-start, safety and shut down procedures
- Routine maintenance and lubricating schedules
- Fault diagnosis and repair procedures
- Spare parts lists; names of suppliers/agents details
- Drawings: These shall include, general arrangements, assembly drawings, parts and materials lists, etc. in A3 size. The names of suppliers/agents, original brochures and instrument literature shall also be included in the manual.

PAE 1.11. Route plans to be submitted by the contractor

On completion of the work, but before the certificate of completion will be issued, the contractor shall submit to the Engineer, route plans as well as electronic copies, indicating cable routes in a satisfactory manner:

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- (a) The exact cable routes with reference to fixed points (e.g., buildings);
- (b) The exact length of cable (HT and LT) installed between terminating points and between joints where relevant; and
- (c) The exact positions of cable joints with reference to fixed points (e.g., buildings).

Prints of the various plans for the marking up of the information required will be supplied to the contractor on request.

PAE 1.12. Interchangeability

All equipment must be manufactured to such close tolerance that all similar components and spares must be fully interchangeable without any further alterations or adjustment being necessary.

PAE 1.13. Water and debris accumulation

All outdoor equipment shall be designed so that water and debris will not readily accumulate to cause deterioration of equipment or an electrical discharge hazard. Where this cannot be avoided, such places shall be easily accessible for cleaning.

PAE 1.14. Name tags

Identification tags shall be attached to all equipment, sub-assemblies, components such as instruments, fuses etc., cable ends etc. The tags shall be screws on with brass or plated steel screws (no self-tapping screws will be permitted). Where screws are not possible such as on the cable, other means of attachment must be submitted for approval to the Engineer.

Cables shall be tagged at either end, whether the end terminates in a through joint or an end box, and at regular intervals in between as prescribed in the Detail Specification.

Outdoor tags shall be of stainless steel or brass.

Tags mounted indoors or protected by an enclosure shall be made of Ivorene or similar sandwich material with black letters on a white background.

All lettering and text shall be approved by the Engineer.

Letter sizes must be compatible with the application, e.g.

for fuses, terminals, relays etc.	3 to 5 mm
for panels or cubicles	12 to 20 mm
for switchboards or MCC board names	about 50 mm

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAE 1.15. Fasteners**

All bolts and studs shall protrude at least one thread but not more than four threads through the nut, with all washers in position.

If any bolts, nuts, screws or other fasteners are placed in a position that are not accessible to conventional tools, then the Contractor shall provide special tools. This also applies where the size or shape of the fastener is not conventional.

PAE 1.16. Colour and finishing

All metal parts of equipment shall either be finished in baked enamel or powder coating or galvanized (depending on the circumstances) after manufacture and treatment to SABS 064.

Colours of paint to be used shall be confirmed with the Engineer prior to application.

All steel areas subjected to corrosive atmospheres, which cannot be painted and the paint work must be maintained afterwards, or specified to be galvanized must be hot dip galvanized to SABS 763. The galvanizing must be clean, smooth, of uniform thickness and unblemished. The galvanizing must not affect the mechanical properties of the covered metal.

All drilling welding, cutting and bending must be complete and the metal must be cleaned of any machining blemishes, mill scale, rust and lubricants before galvanizing. If site trimming, drilling and cutting cannot be avoided then all such denuded surfaces must be dressed with cold galvanizing paint.

The Engineer must approve any other proposed corrosion protection before it is applied.

Galvanized areas must be kept free of lubricants.

Wire must be galvanized to SABS 935.

PAE 1.17. Inspections and tests

All equipment will be inspected and tested both in the factory during manufacturing and on-site during installation. The Engineer will prescribe the inspections and tests required elsewhere in this specification. The Engineer will do all inspections accompanied by the Contractor and the Contractor will do all tests with the Engineer as witness.

The Engineer will require seven (7) days notification to avail himself for any test or inspection and the Contractor must arrange for the maximum number of inspections and tests to be done on the same day. The Contractor must provide all testing facilities and instruments, all equipment required for a test or inspection and all safety clothing prescribed by the Engineer.

The instruments must have valid test certificates issued by an accepted testing authority and the results of the test done must be recorded on a test certificate, of which the Engineer must receive two copies. The Engineer reserves the right to call for a calibration test on any instruments used during the test.

The cost of all tests must be included in the tender price.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAE 1.18. Performance tests**

On completion of erection and installation the Contractor must carry out the following tests, where applicable, in addition to any other tests, which may be specified elsewhere:

Before commissioning

- (a) Cable Insulation test.
- (b) Earth continuity test.
- (c) Test for correct direction of rotation of motors and reverse if necessary.
- (d) Test for correct operation of control gear, setting of overload protection equipment, etc.
- (e) The Contractor must obtain SABS test certificates for samples of insulating oil in HT switchgear and transformers. These certificates must be submitted to the Engineer.

On completion of installation and putting into proper operation all the plant and equipment, the Contractor will be required to make suitable arrangements for the testing of all plant and equipment supplied under his Contract and running the plant for at least one week, during which time he shall also train the operators in the correct running of the plant. He shall also explain the maintenance manuals to the operator during this time.

The entire cost of testing including supply of test equipment, must be borne by the Contractor and an adequate allowance for such tests must be made in the Tendered price.

PAE 1.19. Defects liability period

During this period the Contractor must visit the Site at least three times, say 1, 6 and 12 months respectively after the Commissioning Date, to inspect and check all the plant supplied and installed by him for proper operation and to adjust where necessary, and to satisfy himself that the regular maintenance of the plant is being carried out correctly and in accordance with the written instructions supplied by him. The Contractor shall make sufficient provision in the correct price for these visits.

PAE 1.20. Spares

Tenderers shall submit on the appropriate Schedule in this document a list of spares and special tools which is recommended and should be kept by the Employer for maintenance of the plant. Spares which the Employer decides to order must be manufactured simultaneously with the rest of the equipment and be subjected to the same tests for dimensions, tolerance, strength, etc. All spares and special tools must be packed separately and the cases appropriately marked. All spares and special tools must be new and unused and where possible should be standard to all sections of the plant.

PAE 1.21. Low voltage electric motors

All electric motors shall fully comply with the following relevant standards:

SABS 1189, SABS 948, BS 4999 and BS 5000 or IECS 34 and IECS 72.

When ordering electric motors for a specific application the Contractor shall ensure that the orientation of the terminal boxes on the motors are suitable for vertical cable entry from below

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with the motor installed in position and provided with suitable cable entry holes to accommodate the specific cable glands (Holes to be tapped in case of cast boxes).

All three phase low voltage motors shall be of the squirrel cage induction type.

Unless a power rating for a motor is specified, all motors shall be rated for continuous operation (Duty Class S1) at an output of 15% in excess of the maximum power requirements of the associated driven plant when operating at the maximum specified duty at an ambient temperature of 40 °C and an altitude of 1300 m.a.s.l. The minimum class of insulation shall be class F according to SABS 948.

The motors shall be of a recommended standard rating and if the requirements given above fall between two standard ratings, motors of the next higher standard rating must be provided.

The motors shall be either fixed speed, dual speed or speed control units, as required. All motors shall, where possible, be from the same manufacturer to prevent stocking a variety of spares.

The motor speed shall match that of the driven plant but shall not be in excess of 1500 rpm unless otherwise required.

All motors shall be suitable for "direct-on-line" starting unless "star/delta" or other starting methods are prescribed by the supply authority.

The maximum starting current of these motors under locked rotor conditions with specified voltage applied to the motor terminals shall not exceed six times normal full load current.

The motors shall be suitably rated for 15 starts per hour at an ambient temperature of 40 °C and an altitude of 1300 m.a.s.l.

All submersible motors shall be of the IP 68 type and all other motors shall be of the IP 55 IC 01 41 type.

Motors rated at 22kW and above shall each be equipped with three thermister with a positive temperature coefficient of resistance embedded in the overhang of the stator windings (one per phase) to facilitate the operation of protective devices on overheating of the relevant motor. These thermister and heaters shall be wired to suitable separate terminal boxes on the outside of the motor.

All submersible motors shall be supplied complete with adequately rated underwater cables factory connected onto the motor, for power supply as well as sensing where applicable. These cables shall be sufficient length to reach the connection points, i.e., the nearest readily accessible dry area, without straining the cable and shall have watertight connections onto the motor. Exact lengths of cable required shall be verified on site before finalizing orders.

Motor selection for frequency converter speed applications shall allow for the following:

- (a) The rated motor power shall be in excess of 35% of the maximum power required by the driven machine and shall have the written consent of the manufacturer that the motor rating will suit the application. Motors shall be suitable for continuous operation over the variable speed range of between 50% and 100% of the specified motor speed.
- (b) (The ratio between the maximum torque and the rated torque of the motor must be less than 2.5.

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- (c) The method of cooling of the motor shall be efficient for continuous operation over the abovementioned speed range of the motor and shall either be self-ventilated or separately ventilated type of motor.
- (d) The rated speed of the motor shall be as close as possible to the nominal speed of the driven plant.
- (e) Four-pole motors will be preferred but more pole motors will be acceptable if direct-on-line starting will adversely be affected by the four-pole motor.
- (f) Motor winding insulation must be compatible with frequency converter variable speed operation.
- (g) Noise levels of the motor shall not exceed the value given in SABS 948 appropriated to the rated output and speed range of the motor.
- (h) Variation levels of the motor shall not exceed acceptable vibration amplitudes through the speed range when operating in conjunction with frequency converter variable speed applications.

Dual speed motors shall have separate windings each with differing number of poles. Motor ventilation shall be efficient at the required load torque of the driven plant at both speed settings.

Vibration and noise levels shall not exceed values given in SABS 948 appropriated to the rated output and speed of the motor.

Each motor shall be provided with a grade 304 stainless steel or brass nameplate.

The following information shall be submitted with each Tender in respect of all the three phase low voltage motors offered:

- (a) Two copies of an outline drawing showing main overall dimensions.
- (b) Guaranteed continuous rating under site conditions.
- (c) Guaranteed number of starts per hour at an ambient temperature of 40 °C.
- (d) Guaranteed maximum starting current under locked rotor conditions with the normal voltage connected to the incoming terminals.
- (e) Guaranteed efficiency of the motor at 50% and 100% normal full load with motor windings connected in delta.
- (f) Guaranteed power factor of the motor at 50% and 100% normal full load with the motor windings connected in delta.
- (g) The mass of each motor.
- (h) Copies of SABS test reports if these motors carry the SABS mark.

The following tests shall be carried out at the Manufacturer's Works on these motors after manufacture:

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- (a) If the motor does not carry the SABS mark, performance and efficiency tests shall be carried out to prove the guaranteed information submitted with the successful Tender. These tests must be performed by the South African Bureau of Standards and a certificate of approval must be submitted stating that the motors comply with the requirements of SABS 948.
- (b) All motors shall be subjected to routine tests as prescribed in Appendix D to SABS 948.

The manufacturer **must submit** to the Engineer two certified copies of test certificates reflecting the conditions and results of the tests carried out on each motor.

After installation on Site, but prior to commissioning, the following test shall be carried out:

- (a) Ensure that the bearings are properly lubricated.
- (b) Ensure that all power and earth connections are properly made.
- (c) Check all ventilation openings for obstruction.
- (d) Measure the insulation resistance between phases mutually and between each phase and earth to ensure that the windings are dry.
- (e) Spin the motor by briefly switching the supply on to check the correctness of the direction of rotation. After the motor has been started the following shall be observed:
- (f) Smoothness and period of acceleration up to maximum speed.
- (g) Noise, vibration and temperatures of motor and bearings.

Seal leak detectors for submersible pump and motor sets

All submersible pump motor sets shall be provided complete with humidity sensors to facilitate seal leak detection as well as an underwater cable connection for each detector as specified for submersible motors.

PAE 1.22. Electrical actuators for valve control

Electrical actuator motors for valve and sluice gate control shall be rated in excess of 50% of the maximum power required to open and close the valve or sluice gate.

The actuators shall be complete with continuous local position indication providing a 4-20mA signal for remote position indication and suitable for remote control by means of a 4-20ma signal if required as indicated in the detail technical specification.

Electric actuators for plug valve control shall be suitable for valve position selection by means of a local as well as remote non-maintainable signal and limit switches built into the actuator to facilitate positive positioning of the plug valve in any of the positions selected. The actuator shall be provided with local valve position indication as well as facilities for remote indication.

NB: Gears of synthetic materials will not be acceptable in these units.

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PAE 1.23. Multicore cables and earthwires

PAE 1.23.1. Low and Medium Voltage Cables

All multi core-cables used on this contract shall comply with the requirements laid down in SABS 1507 – 1990 as amended to date for PVC PVC SWA PVC cables with copper conductors and insulated for 500/3300-volt grade.

Cables for status and analog signals shall consist of the requisite size and number of copper twisted pairs, individually and overall screened, PVC sheathed, steel wire armoured and PVC covered, complying with the requirements of SABS 1507 where applicable.

Cable and earth wires for a specific application shall be selected strictly in accordance with the requirements laid down in SABS 0142 in respect of current rating and voltage drop. Where practicable the earth continuity conductor shall form an integral part of the cable.

PAE 1.23.2. Fibre Optic Cables

The cable shall have a GRP centre strengthening member, colour coded fibres in gel filled loose tubes, surrounded by interstitial water blocking gel, aramid strengthening member, paper binder, polyethylene bedding sheath, plastic coated corrugated steel type armour and polyethylene water resistant outer sheath.

The steel armour shall be polymer coated and bonded to the sheath.

The fibre shall be manufactured from pure silica cladding, minimally doped with Phosphorous and Fluorine to achieve a matched cladding and a graded Germanium doped silica core. The primary coating shall consist of two layers of UV curable acryline resin.

Attenuation uniformity shall be checked at both 850nm and 1300nm with a pulse width not exceeding 1 micro's. Fibres with points or steps of discontinuity greater than 0,3dB shall be rejected. For fibre lengths in excess of 1km the attenuation coefficient over the length of fibre shall not vary by more than 0,3dB/km.

The fibre shall withstand a mechanical strain of at least 8N for 1 second and shall have an attenuation increase of less than 0.005dB/turn under a bend resistance test using 100 turns around a 75mm diameter mandrel.

PAE 1.24. Jointing of cables

Joints will only be allowed where more than one full drum length of cable is necessary to complete a specific circuit and must be restricted to the absolute minimum. All joints shall be made to the best practice by competent cable jointers using first class material. The contractor shall maintain the electrical continuity of the armouring in an approved manner at all straight through joints.

Low voltage power and control cables

Joints shall only be allowed where more than one drum length of cable is necessary to complete a specific circuit.

The jointing kit shall be equal and similar to Raychem heat-shrinkable joints for cables up to 1 kV.

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The joints shall be made to the manufacturer's instructions and with materials stipulated in such instructions.

PAE 1.25. Termination of multicore cables

PAE 1.25.1. Low voltage multi core power and control cables

Cables are to be terminated with glands manufactured of bronze and comprising a barrel with sealing washer and bush nut screwed into one end and a compression nipple with wire clamping ring screwed onto the other end. The opposite end of the compression nipple must have a male electrical thread with locknut. The glands shall be suitably sized for the relevant cables, be of the adjustable type complete with armour clamps and with watertight neoprene shrouds.

Cable terminating glands for outdoor use shall be provided with waterproofing inner seals as well as waterproofing seals on nipples. Cable armouring shall be earthed at each end but may not be used as earth continuity conductor.

PAE 1.25.2. Fibre Optic Cables

Fibre optic cables shall be terminated by means of suitable glands, ST connections and bus terminals capable of direct connection to the bus interfaces on the bus stations. These bus stations will be housed in separate panels of various control centres.

PAE 1.26. Distribution and motor control boards

PAE 1.26.1. Indoor floor standing distribution and motor control boards

Construction

The board shall be designed for front access only unless stated otherwise in the schedules.

The boards shall be of the free-standing floor mounted cubicle type with IP 55 insert proofed enclosure, constructed of at least 2mm 3CR12 steel or mild steel powder coated on a rigid channel iron or similar frame, and shall be bolted down in position by means of M16 high tensile stainless steel bolts grouted into the concrete floor.

The bolts shall be inside the board.

The overall height of the board shall not exceed 2,00m and the overall depth shall not be less than 450mm and shall not exceed 0,6m. The construction of the board shall be such that future extension panels may be fitted on both sides and alterations can be done without major changes to the board. (Modular construction will be preferred.)

The board shall be provided with readily removable covers on the side and hinged panels on the front.

All removable covers shall be provided with pre-approved handles or similar approved to facilitate removal. These covers shall be suitable braced and reinforced to ensure rigidity.

All hinged panels shall be reinforced to ensure rigidity and shall be provided with heavy duty rust proof hinges.

These panels shall also be provided with approved knobs or handles.

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Each door shall be supplied with completely concealed hinges, each fastened with not less than four (two on each side) brass bolts and nuts. In the case of double doors the first door shall be locked with two slides on the inside, onto the kiosk shell. The second door shall close over a lip on the first one.

The doors shall be provided with a locking system suitable for padlocking. The locking system shall consist of a 3-way locking mechanism locking the door at the top, middle and bottom. The padlock shall be enclosed in a tamper proof enclosure as part of the door construction.

All switch gear, instruments and equipment for the control of any specific motor or other electrical device, shall be mounted flush behind a common hinged panel, with only operating handles, push buttons and instrument faces protruding through neatly machine punched holes in the panel.

The board shall be provided with a readily removable, rigidly supported unpainted 3CR12 or HDG cable end support gland plate along the entire length of the board and at least 230mm above floor level.

Space shall be provided for future switchgear and equipment where specified.

The board shall be suitably sized to accommodate without cramping, all the switchgear and equipment specified.

Screwed-on engraved labels in English shall be provided below all switchgear and equipment on the panels, to facilitate identification.

The board shall be provided with one set of four solid, copper bus bars in the top section and extending over the entire length of the board. Provision shall be made at the end of each bus bar for future extensions.

Bus bars shall comply with the requirements of BSS 1433 and the relevant clauses of BSS 159.

Bus bars shall be rigidly supported at suitable intervals to prevent undue damage resulting under short circuit conditions. Ceramic or other approved bus bar insulators shall be used. The bus bars shall be arranged horizontally with the longer sides of the cross-sections in the vertical plane and one behind the other, in the horizontal plane, at 90 mm centers.

Bus bars shall be clearly and indelibly marked Red, White and Blue for the three phases and Black for Neutral.

Connections to bus bars shall be effected by means of cable lugs and suitable sized cadmium-plated, high tensile steel bolts and nuts with cadmium-plated cup washers or lock washers.

All screws, studs, bolts, nuts and washers used for these boards shall be Grade 304 Stainless Steel. The use of self-tapping screws will not be permissible. A solid copper earth bar shall be provided inside the board at the back and along the entire length, at a height of approximately 0,6m above floor level.

The earth bar shall have a cross-section of 150 mm².

The earth bars shall be drilled and provided with the required number of 6 mm dia and 10 mm dia cadmium plated, high tensile steel bolts and nuts, complete with cadmium-plated washers and cup washers or lock washers, for making the earth connection. The earth positions shall be evenly spaced along the entire length of each bus bar.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PAE 1.26.2.Paint finishes for electrical materials and equipment

The paint finishes for electrical materials and equipment where applicable shall strictly comply with the quality specification.

PAE 1.26.3.Internal wiring

The internal wiring of the boards shall consist of colored PVC-installed conductors of adequate copper cross-section, which shall be neatly installed horizontally and vertically installed in PVC trunking. Numbered ferrules of an approved type (clip on type not acceptable), shall be provided on each end of each wire, to facilitate the tracing of circuits.

PAE 1.26.4.Electronic Equipment

Where electronic equipment such as transmitting I/O units are incorporated in a distribution- and motor control board, this equipment shall be installed in a separate and special compartment.

Sufficient room shall be provided for the rail mounted terminal strips, equal and similar to Klippon Type SAKR, which will be supplied and installed by the monitor and control system contractor.

The door must be labeled: "ELECTRONIC EQUIPMENT".

PAE 1.26.5.Labeling of Switchboards and Motor Control Boards

A screwed on engraved label of the black on white "trefolite" type shall be provided below each item of equipment on the front panel of each board as well as on the chassis in close proximity to the relevant equipment to identify such equipment in the English language in 6 mm high lettering.

Each board shall further be provided with a screwed-on reverse engraved yellow Perspex nameplate with black 20 mm high lettering to identify the board in the English language on the outside of the door at the top thereof.

a) Outdoor distribution- and motor control boards

The outdoor motor control boards shall be of the grade 304 stainless steel or mild steel powder coated cubicle type complying with the specification for indoor boards, but shall be not more than 2000 mm high.

Where electronic equipment such as transmitting I/O units are incorporated in a distribution- and motor control board, this equipment shall be installed in a separate and special compartment.

Sufficient room shall be provided for the rail mounted terminal strips, equal and similar to Klippon Type SAKR, which will be supplied and installed by the monitor and control system contractor.

This compartment shall consist of a outer and inner shell with at least 10 mm insulation or polystyrene between the inner and outer shell all round to keep the temperature inside the compartment at least 5° C below the temperature surrounding the compartment in summer. If necessary, ventilation fans shall be installed.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



The doors of this compartment must also be of a double wall construction with insulation or polystyrene between the two walls. The door must be labeled:

- b) "Electronic Equipment"

Sufficient provision for breathing and heat dissipation must be made in this compartment.

PAE 1.26.6. Control board components

- a) Isolators

All isolators shall be of the "Load-breaking" and "fault-making" type and shall comply with the requirements of BS 5419-1977 where applicable. Where relevant, isolators shall be provided with auxiliary contacts for signal purposes.

- b) Fused switches

All fused switches shall be of the "load-breaking" and "fault-making" type complying with BS-5419 where applicable and fitted with HRC cartridge fused links to BSS-88. Auxiliary contacts shall be provided where relevant for signal purposes.

- c) Moulded case circuit breaker

All moulded case circuit breakers shall comply with the requirements of SABS specification No 156-1977 and shall be equal and similar to Heinemann manufacture.

These circuit breakers shall be fitted with copper terminal collector bars where more than one cable tail has to be terminated on the same terminal.

- d) 400 Volt air-break contactors

All contactors shall be of the totally enclosed, three pole, double air break per pole, automatic magnetic type complying with the requirements of IEC 158-1 for Class AC3 contactors of Intermittent Duty Class 0, 3.

All contactors shall be provided with arc extinguisher and readily replaceable silver or silver-alloy contacts rated for at least 2-million "on" and "off" switching operations at rated current.

Each contactor shall be provided with a 240 Volt, 50 Hz closing coil suitable for continuous operation and at least 15 closing operations per hour.

An adequate number of auxiliary contacts shall be fitted.

The contactor may not hum or chatter in service and the contacts may not bounce on closing.

- e) Current Limiting Circuit Breakers

The current limiting circuit breakers shall be capable of remaining in service and of carrying their normal rated current after having interrupted the maximum rated short circuit current at least three times.

The current limiting circuit breaker shall be equal and similar to the Merlin and Gerin or Unelec type for air circuit breakers and Merlin and Gerin or CBI for moulded case circuit breakers.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



f) Direct-on-Line starters (400V motors)

These starters shall be of the manually operated (locally and remotely) type and each starter shall be contained in its own separate compartment on the relevant motor control board.

Each of these units shall comprise amongst other the following components:

- 1 Only mains fused switch connected to the bus bars of the board and interlocked with the door of the compartment to prevent opening of the door with the switch closed and to prevent closing of the switch with the door open.
- 1 Set of HRC control fused links with carriers and basis;

All necessary relays as required;

- 1 Only mains contactor;
- 1 Set of START and STOP push buttons;
- 1 Only mains operated timing device to limit starts to 15 starts per hour; and
- 1 Only power factor correction capacitor unit for motors of 5 kW and more.

The following protective and indicating devices complete with necessary suitable rated potential fuses, current transformers, test blocks and auxiliary relays;

- 1 Only motor protection relay (Electronic type equal and similar to Newelec KC) for motors of 11kW or more or as specified;
- 1 Only motor under current relay (Where specified)
- 1 Only instantaneous indicating ammeter for motor current;
- 1 Only ammeter selector switch for motors of 5kW or more;
- 3 Current transformers for motors of 5 kW or more;
- 1 Only running hour meter;
- 1 Only anti-dither circuit;
- 1 Only anti-cycle timer; and
- 1 Only thermister relay for motors of 22 kW or more
- 1 Only blue LED type indicator light to indicate the time delayed starting period
- 3 Only LED type indicator lights as follows:

Green – 'Supply on'; Amber – 'Motor Running'; and Red – 'Motor Tripped';

It shall further be possible to trip and lock-out the starter by means of a remote stop button to be provided at the relevant motor.

Provision shall also be made for locking the mains fused switch handle in the OFF position.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Star/Delta Starters (400V motors)

These starters shall be of the automatic star/delta type and each starter shall be contained in its own separate compartment on the relevant motor control board.

Each of these units shall comprise amongst others provided for direct-on –line starters the following components as:

- 1 Only Main Isolator connected to the bus bars of the board and interlocked with the door of the compartment to prevent opening of the door with the switch closed and to prevent closing of the switch with the door open;
- 3 Only HRC fuses rigidly attached to the load side of the abovementioned Mains Isolator and the rating of which shall be carefully selected for back-up protection for the relevant motor;
- 1 set of HRC control fused links with carriers and bases;
- 1 only Mains Contactor;
- 1 only Star Contactor;
- 1 only Delta Contactor;
- 1 only Star to Delta timer of the clockwork or electromagnetic type;
- 1 only Mains operated timing device to limit the starts to 15 starts per hour;
- 1 set START and STOP pushbuttons;
- 1 only Three phase Factor Correction Capacitator unit for motors of 5kW or more

All necessary relays.

Variable Speed Drives

These variable speed drives shall each be contained in its own separate panel, manufactured and equipped to the satisfaction of the variable speed drive manufacturer to suit their own requirements with regard to ventilation of the variable speed drive.

The variable speed drive panel shall be equipped with air filters.

The frequency converter shall make use of flux vector control without encoder or tach generator feedback and shall incorporate direct torque control technology so that the overall effectiveness of the drive shall only be limited by the performance of the motor.

Semi-conductor shall be determined by the values of flux and torque and shall not have a predetermined pattern as in conventional pulse width modulation flux vector drives.

Each of these drives shall comprise amongst others the following components:

- 1 Only main isolator that shall be interlocked with the door of the panel to prevent opening of the door with the switch closed and to prevent closing of the switch with the door open.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- 3 Only ultra rapid fuses rigid connected to the load side of the above-mentioned mains isolator and the rating of which shall comply with the manufacturers specifications for the drive.
- 1 Only direct torque control frequency converter.
- 1 Only door mounted control panel complete with cable connections.
- 1 Only Thermister relay for motors of 22 kW or more.
- 1 Only external EMC line filter.

All equipment necessary for remote emergency stop device.

All equipment necessary for remote speed control via a monitoring and control SCADA system as well as PLC control.

All equipment necessary for remote motor status and speed monitoring.

A hot dipped galvanized gland plate must be provided at least 250mm above floor level for cable connection.

(a) The control panel shall be the user interface for monitoring, adjusting parameters and controlling the drive operation. It shall be possible to:

- i) Enter start-up data into the drive.
- ii) Control the drive with start, stop and reference signals.
- iii) Display actual values of motor performance.

Display information on at least the five most recent faults.

(b) The drives shall satisfy the following technical requirements.

- iv) The static speed control error shall not exceed $\pm 0,5\%$ of motor nominal speed.
- v) Fundamental power factor shall be at least 0,97 at nominal load.
- vi) Efficiency shall be at least 98% at nominal power level.
- vii) The drive shall operate satisfactorily under all ambient temperature conditions between -5°C and $+ 40^{\circ}\text{C}$ at an altitude of 1260m above sea level and humidity up to saturation point.
- viii) The drive shall provide output protection of motor overload, over current, short circuit at start, earth fault, missing motor phase and over frequency.
- ix) The drive shall satisfy the following minimum harmonic voltage limits. Total harmonic distortion of 6%, odd harmonic distortion of 4% and even harmonic distortion of 2%. These harmonic distortion parameters shall be measured by the Contractor after commissioning of the system and if the equipment fail to comply with this requirement, the Contractor will have to rectify the same to the satisfaction of the Engineer.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- x) The drive shall be equipped with an AC choke for harmonic current reduction and shall be placed on the AC side of the rectifier bridge in order to protect the rectifier semiconductors against power line transients.
- xi) Torque step rise time shall typically be less than 5ms.
- xii) Stringent precautions must be taken in the design of the protection equipment to assure adequate lightning and surge protection.

Current transformers

All current transformers shall be of the air insulated type complying in all respects with the requirements laid down in BS 3938: 1973.

The contractor shall carefully select the ratio, burden and accuracy class to suit its application in accordance with the recommendations and requirements of BS 3938.

Indicating instruments

All indicating instruments shall comply with the requirements laid down in BS 89: Part 1:

1970 for instruments of a 2, 5 Accuracy Class. All indicating instruments shall have 96 mm square dials.

The maximum demand ammeters shall be of the 6-amp combined maximum demand registering and instantaneous type having MISC movement and thermal demand indication with an integrating time lag of 15 minutes. The ammeter scales shall be direct reading with a full-scale deflection corresponding to 120% of the rated primary current of the relevant current transformer. Each ammeter shall be clearly and indelibly marked to indicate the colour of the phase to which it is connected.

The ammeter for motor starters shall be 5 amp instantaneous indicating meters with MICSC movement and direct reading scales. The meter shall be able to withstand over currents resulting under starting conditions and the full load current of the relevant motor shall be clearly marked in red on the face of the meter.

Voltmeter shall be of the direct reading moving iron suppressed zero type.

The power factor meters shall indicate from 0,7 lagging to 0,7 leading.

The running hour meters shall have cyclometer dials indicating up to 5 digits and two decimals.

Instrument selector switch

A four-position rotary type instrument selector switch shall be mounted directly below the relevant instrument in such a way that only the selector knob and indicator plate are on the panel, and the switch itself is behind the panel.

The selector knob shall consist of bakelite, and shall have an arrow engraved on it, indicating the switch position.

The switch shall have a positively driven switching mechanism.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



The indicator plate shall consist of bakelite and shall have the positions of the three phases and "OFF", engraved on it in 5 mm high lettering.

Power factor correction capacitors for 400 Volt motors

Each of these capacitors shall be the indoor switchboard mounting 400 Volt 50 cps three phase self-contained type with a dead casing and shall fully comply with the requirements laid down in BS 1650-1971.

Each capacitor unit shall be of carefully selected rating to correct the power factor of its associated motor to 0,95 at full load and should not exceed a value which compensates for 85% of the no-load magnetizing current.

The dielectric shall consist of plastic film and low-loss paper situated between aluminum foil and impregnated with a synthetic liquid agent with scavenger additive.

The capacitor losses shall not exceed 1 Watt/k VAR.

The capacitor units shall have the following admissible overload at an ambient temperature of 40°C and an altitude 1260 m above sea level.

- 10% excess volts continuously;
- 50% excess current continuously; and
- 30% excess kVAR continuously.

Each of these capacitor units shall be provided with discharge resistors and a fuser each winding element that will disconnect the affected element in event of a de-electric breakdown.

Information to be submitted with Tenders in respect of the 400 Volt distribution boards and motor control boards. The following information shall be submitted with each Tender in respect of all boards offered:

- (a) Full technical details and descriptive literature regarding all equipment and instruments offered;
- (b) Three paper prints of an outline drawing of each board indicating the main overall dimensions and general lay-out of the boards; and
- (c) Three paper prints of an outline drawing of the front-end processor cabinet indicating the main overall dimensions, general layout and type of material employed on the face of the panel.

Information to be submitted by the successful Tenderer in respect of all boards. The successful Tenderer shall submit three paper prints of each of the following drawings, in respect of each of the boards to the Engineer for approved prior to manufacture:

- (a) Outline and general arrangement drawings, showing main overall dimensions and construction details;
- (b) A wiring diagram; and
- (c) A single line diagram.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



- (d) Plastic transparent prints of the following drawings shall be supplied to the successful Tenderer in respect of each of the final layout of the boards.
 - i) Outline and general arrangement drawing of each board;
 - ii) A wiring diagram of each board and mimic panel;
 - iii) A single line diagram of each board;
 - iv) A paper print of the single line diagram for that specific distribution board, shall be framed and installed behind glass in each of the switch rooms. These drawings shall be furnished on A2 prints; and
 - v) A paper print of the single line diagram for each LT starter panel shall be installed behind Perspex inside the door of each starter panel.

Testing of distribution/motor control boards at the manufacturer's works

Each distribution/motor control board shall be subjected to the following tests in the manufacturer's works after manufacture:

- (a) A thorough inspection shall be carried out to ensure compliance with the specification and approved drawings and wiring diagrams and to ascertain that all connections are properly made.
- (b) A high voltage test on all primary connections to check the insulation between phases manually and between each phase and earth.
- (c) The polarities and ratios of all potential and current transformer shall be checked.
- (d) Primary and secondary injection tests shall be carried out on all switching, protection, metering interlocking and indication circuits.

The manufacturer shall submit three copies of test certificates giving details of conditions and results of tests carried out to the Engineer.

PAE 1.27. Concrete plinth for starter panels and pedestals

The plinth shall be cast 150 mm below as well as 150 mm above the ground level. It shall have neatly beveled edges and shall be 75 mm wider than the panels all round.

An opening of sufficient width to allow for cable entry, shall be provided under the starter panels.

The grade 304 stainless steel foundation bolts for mounting of the panels be cast or grouted into the plinth. The plinth shall be in Class 20/19 concrete and shall be suitably reinforced if necessary.

It is recommended that the casting of these foundations must be carried out by the Civil Contractor at the cost of the Contractor under this contract in accordance with his instructions and under his supervision.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAE 1.28. Electronic level control**

The micro based electronic controllers which will be mounted in the starter shall be easy to calibrate and reliable in service.

The power units for all the pumps in a specific pump station shall be installed in a separate compartment of the starter and clearly labelled in accordance with the pumps it controls.

These level controls shall be designed to automatically select the pump sequence to ensure that all the pumps will at random be a duty pump.

Where a controller controls only two pumps and one pump is always a standby pump, the standby pump shall automatically become the next duty pump after each duty cycle, unless one pump is taken down for service. When that occurs, the duty pump shall remain on duty until the normal operation is restored.

When a pump selected for duty fails to respond to the start signal from the control, then the next duty pump shall automatically start-up after five minutes.

The level control must also stop all the pumps, whether on manual or automatic selection, when the pump has reached a predetermined low level.

The transducers shall be designed to operate in air, been capsulated, of rugged construction and impervious to submergence.

The transducers shall, where possible, be installed at a point 500 mm away from a wall or pipe, which may cause a false signal, and at least 500 mm above maximum water level.

The coaxial cable between the transducer and power unit shall be of sufficient length to avoid any joints in this cable, as no joints will be permissible.

The grade 304 stainless steel brackets must be provided and installed under this contract.

PAE 1.29. Emergency stop push buttons and weatherproof isolators

Each of these units shall consist of a totally enclosed outdoor type heavy duty "push and turn to lock" stop push button station with a cable gland entry at the bottom to accommodate a 3 core 1,5 mm² LT PVC SWA PVC cable.

This push button station and weatherproof isolator shall be mounted on a rigid 1-meter-high grade 304 stainless steel pedestal with 2 mm radius rounded edges, designed to be bolted to a concrete floor.

(Refer to the relevant drawing.)

An emergency stop push button shall be installed where indicated near the coupling between each motor and its associated pump and shall be connected to the relevant starter panel via the specified cable to stop the motor.

The pedestal shall be securely bolted to the floor by means of stainless steel foundation bolts grouted into the concrete and care shall be taken to ensure that it is installed plumb.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAE 1.30. Cable ladders**

Cable ladders shall be of the heavy-duty type, equal and similar to O-Line.

Cable ladders shall be hot dipped galvanized or as specified on the drawings the height of the sides shall be 76 mm with the width to suit the number and size of cables to be installed. The cable ladders shall be secured on suitable lengths, which shall be suspended from the roof slab by means of suitable lengths 8 mm dia threaded hot, dipped galvanized steel rods.

The threaded rods shall be secured to the roof slab with suitable sized hot dipped galvanized steel rawl bolts and shall be secured to the channel sections by means of two hot dipped galvanized nuts and washers.

Clamps of the "K" series, suitable for the specific cable shall be employed to secure the cable onto the tray.

PAE 1.31. Lightning protection**PAE 1.31.1.Plant**

The lightning protection of the lightning structures, poles and plant of the works, including all the buildings and handrails on the new plant, form part of this contract.

The lightning protection must be a SABS approved scheme and SABS approved drawing of the scheme must be submitted to the Engineer.

PAE 1.31.2.Lightning arrestors

Tenderers shall allow in their Tender prices for adequate protection of the equipment supplied and installed under this contract against direct as well as induced voltage surges and spikes which may be experienced on the system.

Surge arrestors shall be provided on each phase as well as neutral on the incoming power supply terminals of each board.

Electronic equipment shall be adequately protected on both the incoming and outgoing terminals by means of suitable arrestors compatible with the relevant equipment. 4-20mA signal cables shall be protected on both sides of the cable against surges.

Arrestors shall be of DEHN manufacture (as supplied by Surgetech (Pty) Ltd. or equal and similar thereto).

All arrestors shall be connected directly to earth along the shortest possible route and only conductors of adequate rating for the discharge currents catered for shall be used for connections to arrestors.

Tenderers shall submit full particulars of the arrestors offered as well as written confirmation that it will provide adequate protection for the relevant equipment against possible voltage surges and spikes on the system.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2

**PAE 1.32. Earth clamps**

Earth clamps shall consist of 12 mm x 1,5 mm thick copper strap provided with a 25 mm² x 3 mm dia, brass bolt, nut and washers. The design of the clamp shall be such that it will fit snugly around the conduit without necessitating any extra packing.

PAE 1.33. Underground cable sleeves

All cable sleeves shall be of the Kabelflex type, manufactured and supplied by Nextube (Pty) Ltd.

Unused sleeve ends shall be sealed by means of Nextube Closure Caps.

Cable sleeves to be installed across roads shall extend at least 450 mm beyond the edge of the road on each side. Each run of cable sleeve shall be laid straight and without any projections on the side, which may cause damage to or obstruct the threading through of cables.

PAE 1.34. Notices and danger plates**PAE 1.34.1.Scope**

This specification deals with the provision of Notices and Danger Plates as required in terms of the Occupational Health and Safety Act No. 85 of 1993, as well as any other notices that may be required by law or by the nature of the finished Works.

The following standard specifications are referred to in this specification: -
SABS 0140; Parts I to IV: Identification colour marking.

SABS 1186: Symbolic safety signs.

Occupational Health and Safety Act No 85 of 1993.

PAE 1.34.2.Materials and finish

Outdoor signs shall be either of vitreous enameled type or of cast aluminum with raised or embossed letters.

Indoor notices shall be of non-deteriorating plastic, Perspex or fiberglass.

The colors and size of letters and colors of background shall be in accordance with requirements of SABS 0140 and as approved by the Engineer.

Symbolic signs shall conform to the requirements of SABS 1186.

Signs shall be pre-drilled for fixing.

All fixing accessories shall be of non-corrosive material.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PAE 1.34.3. Installation and erection

The Contractor shall supply and fix permanently in position the signs and notices required by law for all the relevant working areas of the Works. Positions of signs shall be as prescribed by the relevant Regulations and as agreed by the Engineer.

PAE 1.35. Rotating bridge brush gear

The brush gear to be installed on the kingpost on the bridge at the center of the tank to facilitate connections between the incoming supply cable and the cable from the kingpost to the motor starter via the rotating arm, shall consist of the following:

- (a) A set of **four** 20 mm wide and **three** 8 mm wide **brass** slip rings on an ebonite or equivalent insulating sleeve (i.e., three slip rings or phase connections, one for the earth connection, three slip rings for the control circuit, namely, start, common and stop connections). Connections to these slip rings shall be effected via an approved heavy duty terminal block with stud brass terminals onto which the lugs on the cable tails shall be bolted. This terminal arrangement shall be completely independent of fixing screws for the slip rings.
- (b) A set of four main circuit and three control circuit "Morganite" carbon brushes, or equivalent. Each of these brushes shall be spring-loaded to ensure high contact pressure and the springs shall be rust-proofed.

The abovementioned brush gear shall be installed in a weatherproof IP55 grade 304 stainless steel housing with a weatherproof access door, on the kingpost of the bridge. This brush gear-housing shall be suitably sized to accommodate the relevant equipment without cramping, and shall be insect proofed.

The brush gear housing shall be designed and constructed to prevent the accumulation of gas and the condensation of moisture inside the housing and the pressure of the brushes on the slip rings shall be high enough to obtain a self-cleaning effect during operation.

The driving motor must be provided with a weatherproof emergency stop push button station mounted on the bridge in close proximity to the bridge access ladder. The supply and installation of cables between the motor, emergency push button station, brush gear and kingpost, shall form part of this Contract. The cable shall be installed in a grade 304 stainless steel conduit mounted on the underside of the bridge.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PAE 2 GENERAL TECHNICAL REQUIREMENTS FOR THE EXECUTION OF THE ELECTRICAL WORKS (CONSTRUCTION)

PAE 2.1. Installation of multicore cables

PAE 2.1.1. Cable Trenches

The contractor will be responsible for the excavation, bedding, back-filling, consolidating and making good of all cable trenches along the routes indicated on the drawings, with the exception of those sections of the cable routes where it is specifically on the accompanying drawings that open cable ducts will be provided by others. Where indicated on drawings ducts inside new buildings will be provided by others. The Contractor however will be responsible for the bedding and filling soil in cable ducts where necessary. A sealing screed to cover the cable duct shall be provided by others.

NOTE: Tenderers shall acquaint themselves fully with the nature and formation of the ground in which the cables are to be laid, before submitting a Tender. No subsequent claim for extras due to lack of knowledge in this respect will be entertained by the Employer.

Cable trenches for L.T. power and lighting cables shall be deep enough to facilitate the laying of these cables at a depth of 750 mm below final ground level.

Trenches for H.T. power cables shall be deep enough to facilitate the laying of these cables at a depth of 1 m below ground level. The floors of all cable trenches shall be smooth and free from boulders and sharp rock projections.

Plastic danger tape shall be installed in all cable trenches 300 mm above the cables for cable protection during future excavation.

Each cable shall be laid in a bedding of river sand or sifted soil 75 mm over and 75 mm below the cable-clayey soil will not be accepted as bedding.

No cable trench shall be back-filled before the cable(s) in the trench has been inspected and approved by the Engineer.

Underground Cable Pipes

Cable pipes will be supplied and installed by others unless indicated otherwise on the drawings.

Each cable pipe shall be sealed by the Contractor under this Contract at both ends by means of bitumen impregnated jute bags or similar material, after the cable have been installed.

PAE 2.1.2. Crossings with Other Services

a) General

Where a cable is laid above another service it shall not be less than 750 mm below ground level, and if this is not possible, the cable shall be laid underneath the other service and shall be protected by means of concrete slabs in the manner prescribed. The deeper or shallower positions of the cable shall only apply for a distance of 1 m both directions of the crossing. If not possible to cross underneath the other service the matter shall be referred to the Engineer for a decision.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



b) Clearances

The following minimum clearances shall be maintained between electrical cables and other services:

	VERTICAL	HORIZONTAL
Telkom cables	0,3 m	0,3m
Other water pipes	0,3m	0,3m
Sewerage pipes	0,3m	0,8m
Storm water pipes	0,3m	0,6m
Other Electrical cables	150mm	150mm

PAE 2.1.3. Laying of Cables

a) Cables must be laid without delay

The cables shall be laid with minimum of delay in order to backfill the trenches as soon as possible

The Contractor shall, however not backfill the trench until each length of cable has been tested, inspected and approved by the Engineer.

Only one cable shall be laid at a time and the Contractor shall ensure that cables already laid are not damaged.

b) Method

All cables shall be handled with the utmost care and shall be laid in accordance with the best methods observed in good modern practice. All cables shall be run out on rollers in order to prevent abrasion and no cable shall be dragged along the ground. No cables shall be bent to a radius of less than 12 times its overall diameter.

PAE 2.1.4. Installation of Multi core Cables:

(a) In concrete ducts

Cables shall be laid neat parallel with each other on the floor of the duct with the maximum spacing

(b) On cable ladders

Cable shall be installed neat and parallel with each other with the maximum spacing. On Horizontal sections the cables shall be secured to the cable ladders with intervals of not more than 2 m. On vertical sections or where the cable ladders are installed at an angle the cables shall be secured to the cable ladders with interval with intervals of not less than 500 m. Sections of the cable ladders shall be electrically connected and provision shall be made for crimping and expansion of the racks.

(c) In Trenches

Two or more L.T. cables in the same trench shall be laid in parallel and not less than 75 mm apart, except where otherwise approved.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



H.T. cables in the same trench shall be laid parallel and not less than 150 mm apart, except where otherwise approved.

All L.T. power cables shall be laid 750 mm below final ground level and H.T. power cables shall be laid 1 m below final ground level.

The contractor shall provide 3 m slack at each run of power cable and its associated earth wire and bury the same in the ground as near to the relevant end as possible. Where the cables and earth wires are to be installed in open ducts outside buildings, the slack shall be coiled in the ducts.

The separation between any signal cable and the nearest parallel power cable shall not be less than 150 mm.

(d) Against Walls

Cables and earth wires to be installed on walls, where approved by the Engineer, shall be neatly installed on heavy duty hot dipped galvanized steel cable racks. Cables and earth wires on outside walls shall be installed in a similar manner or in suitably sized hot dipped galvanized conduit from 300 mm below up to 2,4 m above final ground level or as required. These conduits shall be secured to the walls by means of hot dipped galvanized steel bath holders at intervals not exceeding 600 mm. (Hospital Saddles).

Saddles shall be secured by means of round headed hot dipped galvanized screws and plugs of an approved type. (Wood will not be accepted as plugging material.) Plug will not be allowed in joints between bricks.

(e) On Poles

Cables and earth wires to be installed on poles shall be secured to the poles at intervals not exceeding 600 mm by means of 25 mm x 1,5 mm adjustable Grade 304 Stainless Steel straps. Each cable together with its associated earth wire shall be installed in a suitably sized stainless steel pipe or channel from 300 mm below up to 2,4 m above ground level. This pipe or channel shall be secured to the pole by means of 25 mm x 1,5 mm adjustable stainless steel straps at intervals not exceeding 600 mm. To avoid metallic action between different materials Neoprene rubber strip shall be installed between the pole and the strap.

(f) Cable Channels on Structures and in Buildings

Where cable channels have been provided on structures and in building these must be backfilled with river sand by the contractor.

PAE 2.1.5. Backfilling of Trenches

Once the cable has been laid, straightened, inspected, approved and covered with the top layer of bedding soil, the trenches shall be backfilled with soil which does not contain more than 40 % rock or shale and will pass through a sieve with 100 mm diameter holes that has been approved by Engineer.

Back-filling of cable trenches shall be done in layers of 150 mm and shall be compacted and consolidated to 95 % modified AASHTO. Test shall be carried out to ensure the required compaction at the cost of the Contractor.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



The closed-up sections of the cable trenches shall be maintained by the Contractor in a proper, safe condition for the duration of the contract. Where the soil in the trenches subsides, it shall be refilled and compacted to the satisfaction of the Engineer.

PAE 2.1.6. Jointing and Terminating of Cables

No joint will be allowed in any run of power cable.

All multi core PVC SWA PVC cables shall be terminated at each end by means of a suitably sized cable gland with amour clamp and Neoprene shroud. The armouring of the cable shall be bonded to earth at each end.

All 11 kV cables shall be terminated in compound filled end boxes.

The termination shall be made to the manufacturer's instructions and with materials stipulated in such instructions and with materials stipulated in such instructions.

Where panels are provided with end boxes, these boxes shall be employed to terminate the cable end boxes and shall be filled with the prescribed mass of compound type Henley list No 57040.

The making off of cable ends shall be done strictly in accordance with the manufacturer's instructions as well as the filling of the boxes.

PAE 2.1.7. Testing of Cables

a) Low voltage cables

On each completed section of laid and joined cable, the insulation shall be tested to approval with an approved "Megger"-type instrument of not less than 500 V.

b) 11 kV cables

On each completed section of laid and jointed high-tension cable a high voltage test shall be carried out. The test shall be performed according to SABS 97 of 1991. Alternating or direct current may be used.

c) Earth wires

Earth wires shall be installed with L.T. cables as and where indicated on the drawings or specified here in and shall consist of bare hard-drawn copper wire.

These earth wires shall be installed at the same depth as the relevant cables, with at least 75 mm clearance between any earth wire and the nearest cable, unless specifically approved otherwise.

No joint will be allowed in any run of earth wire.

Each earth wire shall be terminated at each end by means of a suitably sized bolted lug either sweated or crimped onto the wire. The lugs shall be bolted onto the relevant earth bars or earthing terminals

PAE 2.1.8. Cable Markers

Cable markers with lead labels cast into the top of the cable markers shall be supplied and installed along the cable routes under this Contract as follows:

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



Along straight runs of the route, not further than 25 m apart;
At turns - one on each side of the turning point, 900 mm from such turning points;

At each branch, 3 markers – i.e., one on each side of the branch, 900 mm from the branch.

The cable marker shall be installed deep enough to ensure that the top of the marker will protrude 50 mm above final ground level.

Route Plans to be Submitted by the Contractor

On completion of the works, but before the certificate of completion will be issued, the contractor shall submit to the Engineer, route plans (polyester prints) indicating in a satisfactory manner:

The exact cable routes with reference to fixed points (e.g. buildings);

The exact lengths of cable (H.T and LT) installed between terminating points and between joints where relevant; and

The exact position of cable joints with reference to fixed points (e.g. buildings).

Prints of the various plans for the marking up of the information required, will be supplied to the contractor on request.

PAE 2.2. Plugging of brick walls and concrete

Only plugging material of an approved type may be used for fixing to brick walls and concrete, wood will not be acceptable. Plugging in joints of brick walls will not be acceptable. Only round headed brass screws shall be used for fixing.

Steel structures may not be drilled without written approval of the Engineer. Where steel structures may not be drilled the electrical contractor shall use suitable Grade 304 Stainless Steel clamps for securing the equipment.

PAE 2.3. Installation of distribution boards and motor control boards

Each of the relevant distribution boards and motor control boards shall be securely bolted down on the floor or plinth by means of the requisite number of foundation bolts grouted into the floor in the positions indicated on the drawings.

These positions shall be confirmed with the Engineer on site, prior to installation.

Testing and Commissioning of Distribution/Motor Control Boards After Installation on site

After installation on site but prior to commissioning the following inspections and tests shall be performed on each distribution/motor control board.

Check all components to ensure that they are free from dust and protective packing material;

Check operation of all components liable to damage in transit such as meter and protection measured;

The insulation of all primary circuits between phases mutually and between each phase and earth shall be measured;

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



All fused links shall be checked for electrical continuity; and

All control supplies shall be checked.

All adjustable protection devices shall then be met and the boards commissioned all in consultation with and to the instruction of the Engineer.

PAE 2.4. Earthing

The contractor shall do all the bonding and earthing in accordance with the latest addition of the "Code of Practice for the Wiring of Premises" SABS 0142

The substation and HT switch room earthing shall consist of a 70 mm² bare copper earth wire installed in the same trench as the HT supply cables.

PAE 2.5. Balancing of load

The contractor shall balance the load as evenly as possible over three phases on the main board, as well as on all the motor control boards.

PAE 2.6. Name plates

Cubicles and pedestals shall be marked with the associated motor number. A list of numbers will be provided by the Engineer. The numbers shall be rear engraved on Perspex or similar material. The number shall be black, 40 mm high, on a yellow background. The height of the plate shall be 50 mm. The number shall be secured, on top of the pedestal, as prescribed for distribution boards.

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PAE 3 PRELIMINARY CABLE SIZES

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PAE 3 - PRELIMINARY LOAD LIST

Item	Line Item Description	From	To	Load Size (kw)	Size mm	Cable Type	Voltage (AC) [V]	Length (m)	Voltage Drop (%)
1	Transformer								
1.1	100 KVA Transformer	Transformer	Generator	100	2 x 120	4c-PVC/SWA/PVC Cu	400	800	2.63
1.2	Earth Cable	Transformer	Generator	N/A	120	Bare copper	N/A	400	N/A
2	Generator								
2.1	110 KVA Generator	Generator	Main MCC	110	2 x 120	4c-PVC/SWA/PVC Cu	400	50	0.16
2.2	Earth Cable	Generator	Main MCC	N/A	120	Bare copper	N/A	25	N/A
3	Inlet Works								
3.1	Inlet Works MCC	Main Mcc	Control Room Building Inlet MCC	11	25	4c-PVC/SWA/PVC Cu	400	250	1.78
3.2	Screw Screen	Inlet MCC	Screw Screen	3	1.5	4c-PVC/SWA/PVC Cu	400	25	0.85
3.3	Ultrasonic Flow Meter	Inlet MCC	Ultrasonic Flow Meter	0.12	1.5	3c-PVC/SWA/PVC Cu	230	50	0.73
3.4	Ultrasonic Flow Meter Signal Cable	Inlet MCC	Ultrasonic Flow Meter	N/A	1	2 pair Screened Signal Cable	N/A	50	N/A
3.5	Bare copper earth wire	Inlet MCC	Screw Screen	N/A	1.5	Bare copper	N/A	320	N/A
4	Irrigation Pumps								
4.1	Irrigation Pump No.1 (Soft Starter)	Main Mcc	Irrigation Pump No.1	30	16	4c-PVC/SWA/PVC Cu	400	60	1.9
4.2	Irrigation Pump No.2 (Soft Starter)	Main Mcc	Irrigation Pump No.2	30	16	4c-PVC/SWA/PVC Cu	400	65	2.1
4.3	Irrigation Pumps E-Stop Cables	Main Mcc	Irrigation Pumps	N/A	1.5	3c-PVC/SWA/PVC Cu	230	125	N/A
4.4	Irrigation Pumps Common Discharge Pressure Transmitter	Main Mcc	Irrigation Pumps	N/A	1	2 pair Screened Signal Cable	N/A	70	N/A
4.5	Bare copper earth wire	Main Mcc	Irrigation Pumps	N/A	10	Bare copper	N/A	125	N/A
5	Oxidation Pumps								
5.1	Oxidation Pump No.1 (DOL)	Main Mcc	Oxidation Pump No.1	5.5	2.5	4c-PVC/SWA/PVC Cu	400	50	1.9
5.2	Oxidation Pump No.2 (DOL)	Main Mcc	Oxidation Pump No.2	5.5	2.5	4c-PVC/SWA/PVC Cu	400	55	2.1
5.3	Oxidation Pumps E-Stop Cables	Main Mcc	Oxidation Pumps	N/A	1.5	3c-PVC/SWA/PVC Cu	230	105	N/A
5.4	Oxidation Pumps Common Discharge Pressure Transmitter	Main Mcc	Oxidation Pumps	N/A	1	2 pair Screened Signal Cable	N/A	60	N/A
5.5	Bare copper earth wire	Main Mcc	Oxidation Pumps	N/A	1.5	Bare copper	N/A	125	N/A
6	Biofilter Pumps								
6.1	Biofilter Recirculation Pump No.1 (VSD)	Main Mcc	Biofilter Pump No.1	5.5	2.5	4c-PVC/SWA/PVC Cu	400	45	1.7
6.2	Biofilter Recirculation Pump No.2 (VSD)	Main Mcc	Biofilter Pump No.2	5.5	2.5	4c-PVC/SWA/PVC Cu	400	50	1.9
6.3	Biofilter Recirculation Pumps E-Stop Cables	Main Mcc	Biofilter Pumps	N/A	1.5	3c-PVC/SWA/PVC Cu	230	95	N/A
6.4	Biofilter Recirculation Pumps Common Discharge Pressure Transmitter	Main Mcc	Biofilter Pumps	N/A	1	2 pair Screened Signal Cable	N/A	55	N/A
6.5	Bare copper earth wire	Main Mcc	Biofilter Pumps	N/A	1.5	Bare copper	N/A	95	N/A
7	Humus Sludge Recirculation Pumps								
7.1	Humus Sludge Recirculation Pump No.1 (VSD)	Main Mcc	Humus Sludge Recirculation Pump No.1	5.5	2.5	4c-PVC/SWA/PVC Cu	400	30	1.12
7.2	Humus Sludge Recirculation Pump No.2 (VSD)	Main Mcc	Humus Sludge Recirculation Pump No.2	5.5	2.5	4c-PVC/SWA/PVC Cu	400	35	1.13
7.3	Humus Sludge Recirculation Pumps E-Stop Cables	Main Mcc	Humus Sludge Recirculation Pumps	N/A	1.5	3c-PVC/SWA/PVC Cu	230	65	N/A
7.4	Humus Sludge Recirculation Pumps Common Discharge Pressure Transmitter	Main Mcc	Humus Sludge Recirculation Pumps	N/A	1	2 pair Screened Signal Cable	N/A	40	N/A
7.5	Bare copper earth wire	Main Mcc	Humus Sludge Recirculation Pumps	N/A	1.5	Bare copper	N/A	65	N/A



PAE 3 - PRELIMINARY LOAD LIST

Item	Line Item Description	From	To	Load Size (kw)	Size mm	Cable Type	Voltage (AC) [V]	Length (m)	Voltage Drop (%)
8	Humus Waste Sludge Pumps								
8.1	Humus Waste Sludge Pump No.1 (VSD)	Main Mcc	Humus Waste Sludge Pump No.1	5.5	2.5	4c-PVC/SWA/PVC Cu	400	25	0.9
8.2	Humus Waste Sludge Pump No.2 (VSD)	Main Mcc	Humus Waste Sludge Pump No.2	5.5	2.5	4c-PVC/SWA/PVC Cu	400	30	1.13
8.3	Humus Waste Sludge Pumps E-Stop Cables	Main Mcc	Humus Waste Sludge Pumps	N/A	1.5	3c-PVC/SWA/PVC Cu	230	55	N/A
8.4	Humus Waste Sludge Pumps Common Discharge Pressure Transm	Main Mcc	Humus Waste Sludge Pumps	N/A	1	2 pair Screened Signal Cable	N/A	35	N/A
8.5	Bare copper earth wire	Main Mcc	Humus Waste Sludge Pumps	N/A	1.5	Bare copper	N/A	55	N/A
9	Air Scour Blowers								
9.1	Air Scour Blower No. 1 (DOL)	Main Mcc	Air Scour Blower No.1	5.5	2.5	4c-PVC/SWA/PVC Cu	400	10	0.8
9.2	Air Scour Blower No.2 (DOL)	Main Mcc	Air Scour Blower No.2	5.5	2.5	4c-PVC/SWA/PVC Cu	400	10	0.8
9.3	Air Scour Blowers E-Stop Cables	Main Mcc	Air Scour Blowers	N/A	1.5	3c-PVC/SWA/PVC Cu	230	20	N/A
9.4	Bare copper earth wire	Main Mcc	Air Scour Blowers	N/A	1.5	Bare copper	N/A	20	N/A
10	Sump Drainage Pump								
10.1	Sump Drainage Pump (DOL)	Main Mcc	Sump Drainage Pump	2.2	1.5	4c-PVC/SWA/PVC Cu	400	30	0.75
10.2	Sump Drainage Pump Level Probe	Main Mcc	Sump Drainage Pump	N/A	1.5	3c-PVC/SWA/PVC Cu	230	30	N/A
10.3	Main MCC to Alarm for Emergency High Level in Sump	Main Mcc	Emergency High Level Alarm	N/A	1	2 pair Screened Signal Cable	230	5	N/A
10.4	Bare copper earth wire	Main Mcc	Sump Drainage Pump	N/A	1.5	Bare copper	N/A	30	N/A
11	Disinfection MCC								
11.1	Disinfection MCC	Main Mcc	Disinfection MCC	8	16	4c-PVC/SWA/PVC Cu	400	250	2.25
11.2	Dosing Pump No.1 (DOL)	Disinfection MCC	Dosing Pump No.1	0.16	1.5	3c-PVC/SWA/PVC Cu	230	15	0.19
11.3	Dosing Pump No.2 (DOL)	Disinfection MCC	Dosing Pump No.2	0.16	1.5	3c-PVC/SWA/PVC Cu	230	15	0.19
11.4	Contact Channel Ultrasonic Flow Meter	Disinfection MCC	Contact Channel Ultrasonic Flow Meter	?	1.5	3c-PVC/SWA/PVC Cu	230	50	0.03
11.5	Contact Channel Ultrasonic Flow Meter signal cable	Disinfection MCC	Contact Channel Ultrasonic Flow Meter	N/A	1	2 pair Screened Signal Cable	N/A	50	N/A
11.6	Bare copper earth wire	Disinfection MCC	Dosing Pumps	N/A	6	Bare copper	N/A	250	N/A
12	Clarifier Bridge								
12.1	Clarifier Bridge No.1 (DOL)	Main Mcc	Clarifier Bridge No.1	0.37	1.5	4c-PVC/SWA/PVC Cu	400	40	0.25
12.2	Clarifier Bridge No.2 (DOL)	Main Mcc	Clarifier Bridge No.2	0.37	1.5	4c-PVC/SWA/PVC Cu	400	60	0.37
12.3	Clarifier Bridge No.1 & No.2 E-Stop Cables	Main Mcc	Clarifier Bridge No.1 & No.2	N/A	1.5	3c-PVC/SWA/PVC Cu	230	100	N/A
12.4	Bare copper earth wire	Main Mcc	Clarifier Bridge No.1 & No.2	N/A	1.5	Bare copper	N/A	100	N/A
13	Local Power								
13.1	32A LDB No.1	Main Mcc	Pump Station LDB No.1	7.5	4	4c-PVC/SWA/PVC Cu	400	20	0.6
13.2	32A LDB No.2	Inlet Works MCC	Inlet Works LDB No.2	7.5	4	4c-PVC/SWA/PVC Cu	400	20	0.6
13.3	32A LDB No.3	Disinfection MCC	Disinfection LDB No.3	7.5	4	4c-PVC/SWA/PVC Cu	400	20	0.6
13.4	Bare copper earth wire	All MCC's	LDB No.1 ,No.2 and No.3	N/A	2.5	Bare copper	N/A	60	N/A



PAE 4 PRELIMINARY MOTOR LIST

Contractor	Witness 1	Witness 2	Employer	Witness 1	Witness 2



PAE 4 - PRELIMINARY MOTOR LIST

Item	Line Item Description	Item in Mechanical BoQ	Specific Description	Quantity	Power Rating	Voltage (AC)	Phase	Control
					[kW]	[V]	[-]	[-]
1	Inlet Works							
1.1	Screw Screen	2.2.2	Screw Screen	1	3	400	3-Phase	DOL
1.2	Ultrasonic Flow Meter	2.5.2	Ultrasonic Flow Meter	1	0.1	230	1-Phase	4-20 mA
2	Irrigation Pumps							
2.1	Irrigation Pump No.1	6.1.2	Irrigation Pumps	1	30	400	3-Phase	Soft Starter
2.2	Irrigation Pump No.2	6.1.2	Irrigation Pumps	1	30	400	3-Phase	Soft Starter
3	Oxidation Pumps							
3.1	Oxidation Pump No.1	7.1.2	Oxidation Pumps	1	5.5	400	3-Phase	DOL
3.2	Oxidation Pump No.2	7.1.2	Oxidation Pumps	1	5.5	400	3-Phase	DOL
4	Biofilter Pumps							
4.1	Biofilter Recirculation Pump No.1	8.1.2	Biofilter Pumps	1	5.5	400	3-Phase	VSD
4.2	Biofilter Recirculation Pump No.2	8.1.2	Biofilter Pumps	1	5.5	400	3-Phase	VSD
5	Humus Sludge Recirculation Pumps		Humus Sludge Recirculation Pumps	1	5.5	400	3-Phase	VSD
5.1	Humus Sludge Recirculation Pump No.1	9.1.2	Humus Sludge Recirculation Pumps	1	5.5	400	3-Phase	VSD
5.2	Humus Sludge Recirculation Pump No.2	9.1.2						
6	Humus Waste Sludge Pumps							
6.1	Humus Waste Sludge Pump No.1	10.1.2	Humus Waste Sludge Pumps	1	5.5	400	3-Phase	VSD
6.2	Humus Waste Sludge Pump No.2	10.1.2	Humus Waste Sludge Pumps	1	5.5	400	3-Phase	VSD
7	Air Scour Blowers							
7.1	Air Scour Blower No.1	11.1.2	Air Scour Blowers	1	5.5	400	3-Phase	DOL
7.2	Air Scour Blower No.2	11.1.2	Air Scour Blowers	1	5.5	400	3-Phase	DOL
8	Sump Drainage Pump							
8.1	Sump Drainage Pump	11.2.1	Sump Drainage Pump	1	2.2	400	3-Phase	DOL
9	Disinfection MCC							
9.1	Dosing Pump No.1	12.1.3	Dosing Pump	1	0.16	230	1-Phase	DOL & 4-20 mA
9.2	Dosing Pump No.2	12.1.3	Dosing Pump		0.16	230	1-Phase	DOL & 4-20 mA
9.3	Ultrasonic Flow Meter	12.2.4	Ultrasonic Flow Meter			230	1-Phase	4-20 mA



PAE 4 - PRELIMINARY MOTOR LIST

Item	Line Item Description	Item in Mechanical BoQ	Specific Description	Quantity	Power Rating	Voltage (AC)	Phase	Control
					[kW]	[V]	[-]	[-]
10	Clarifier Bridge							
10.1	Clarifier Bridge No.1	5.1.2	Clarifier Bridge	1	0.37	400	3-Phase	DOL
10.2	Clarifier Bridge No.2	5.1.2	Clarifier Bridge	1	0.37	400	3-Phase	DOL
11	Local Power	Electrical BoQ						
11.1	32A LDB No.1	9.2.1	Pump Station LDB	1	7.5	400	3-Phase	N/A
11.2	32A LDB No.2	9.2.1	Inlet Works LDB	1	7.5	400	3-Phase	N/A
11.3	32A LDB No.3	9.2.1	Disinfection LDB	1	7.5	400	3-Phase	N/A
Sub-Total					140.76	[kW]		
Safety factor of 20 [%]					28.15	[kW]		
Total Power Consumption					168.91	[kW]		



PHUMELELA LOCAL MUNICIPALITY

BID NUMBER : PLMT 24-25/01

APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS

THE CONTRACT: PART C4

PART 4 (OF 5): SITE INFORMATION

CONTENTS

C4.1	Book of Drawings
C4.2	Site Information

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

C4.1: Book of Drawings

LIST OF DRAWINGS

DRAWING NO.	DRAWING TITLE	REVISION
176-100	LAYOUT PLAN	T
176-101	CONTRACT NAMEBOARD	T
176-230	SEWER MANHOLE BENCHING LAYOUTS AND ANCHOR BLOCKS	T
176-231	SEWER MANHOLE AND BENCHING TYPICAL DETAIL	T
176-232	SEWER PIPE TRENCHES AND BEDDING	T
176-233	BASIC GABION LAYOUT	T
176-650	TYPICAL SECURITY FENCE DETAIL	T
176-651	SMALL ROOF STRUCTURE DETAIL	T

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



NOTES

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
T	19-08-2024	ISSUED FOR TENDER	TW BARTLEMAN

DRAWN :	W STOFFBERG	DESIGNED :	TW BARTLEMAN
DATE :	19-08-2024	SCALE :	1:600

CONSULTING ENGINEER TW BARTLEMAN Pr. Eng : 20170117	DATE

CLIENT



PHUMELELA
LOCAL MUNICIPALITY
PHUMELELA LOCAL MUNICIPALITY

CONTRACT ENGINEER



AFRICAN
ENGINEERING & CONSTRUCTION SOLUTIONS

PROJECT

REFURBISHMENT OF VREDE /
THEMBALIHLE WASTEWATER
TREATMENT WORKS

TITLE

GENERAL LAYOUT DRAWING

PLAN NO.	176-100	REVISION	T



TEL No.: 053 330 0234

XXX

TEL No.: XXX



TEL No.: 058 303 1269

XXX

TEL No.: XXX

CONTRACT BOARD
DETAIL
SCALE 1:10



THE BOARD MUST REMAIN UNTIL END OF THE
RETENTION PERIOD

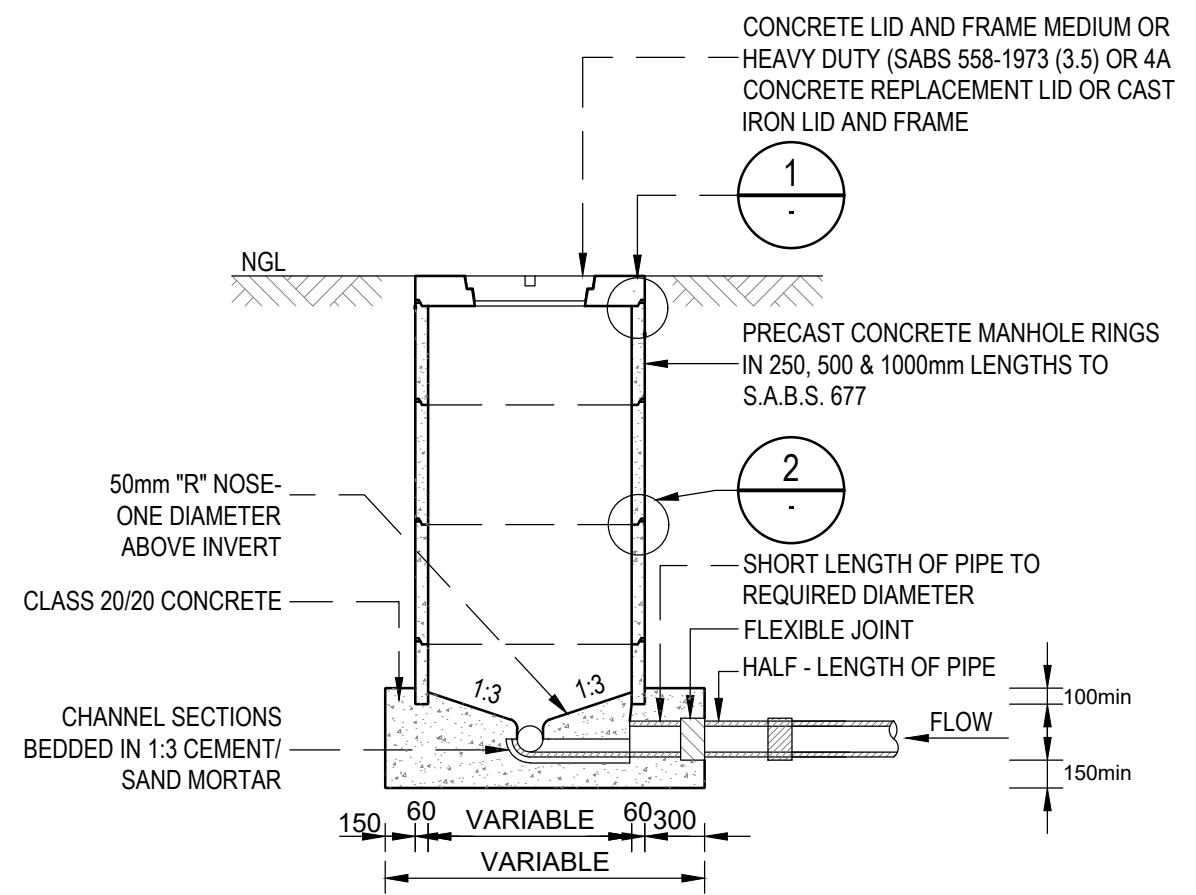


REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS

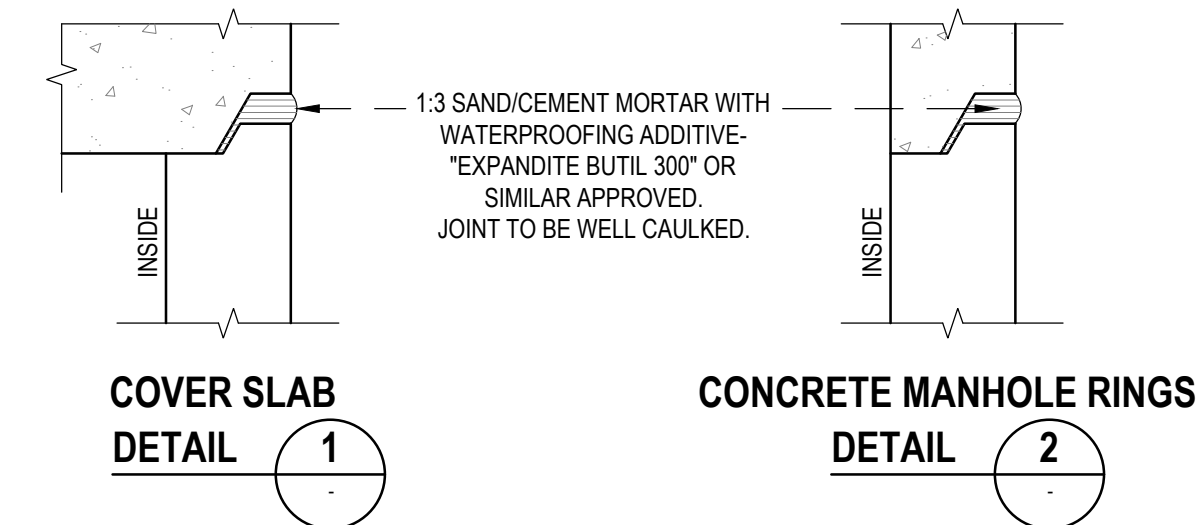
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PLAN NO. 176-101

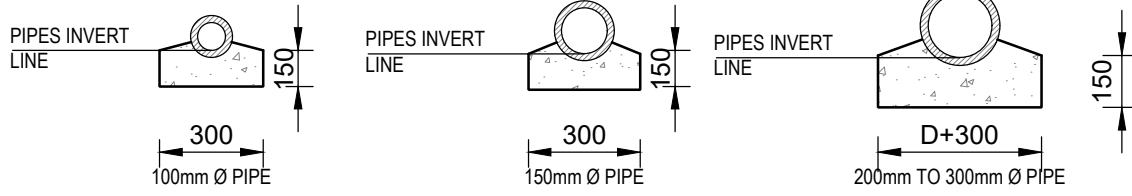
REVISION T



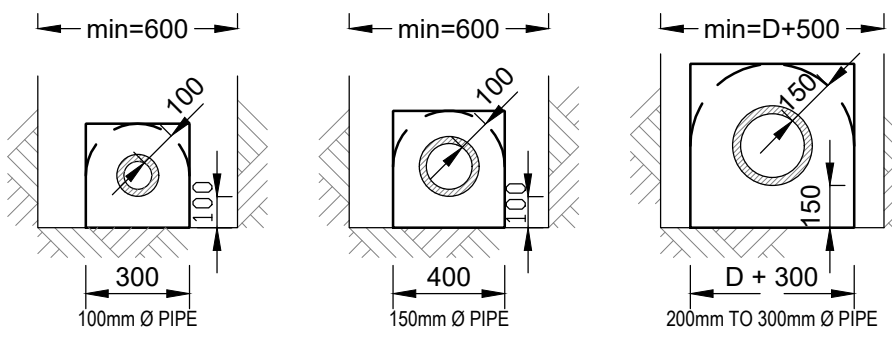
TYPICAL SECTION : MANHOLE CHAMBER



DETAIL R1:
TYPICAL SECTIONS THROUGH MANHOLE

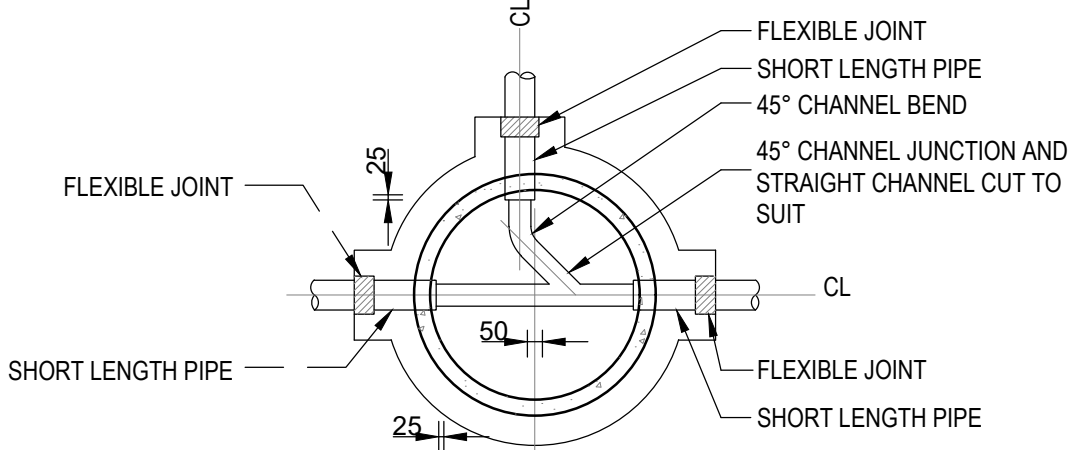


SECTION OF SEWER PIPES ON CONCRETE BEDDING
(ONLY WHERE SPECIFIED)
CLASS 20MPa/20 CONCRETE

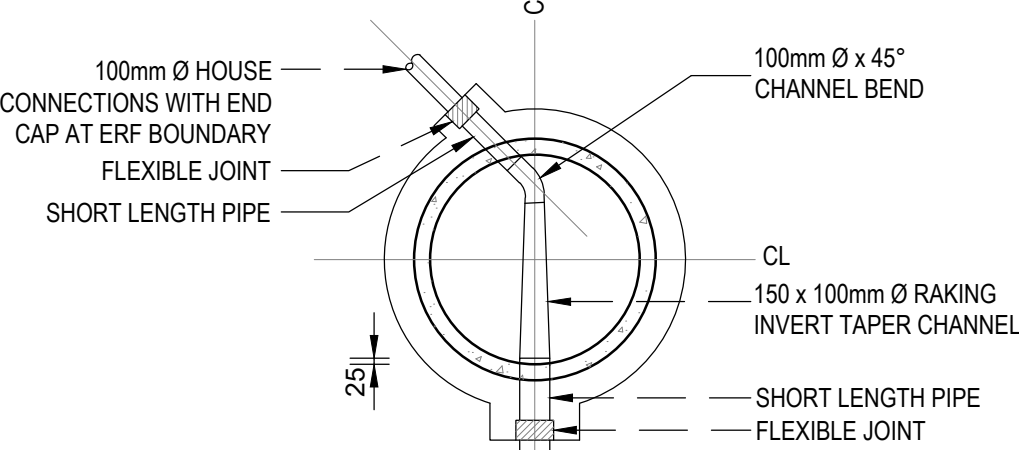


SECTION OF SEWER PIPES ON CONCRETE ENCASING
(ONLY WHERE SPECIFIED)
CLASS 20/20 CONCRETE

DETAIL R2:
MANHOLE DETAIL - CONCRETE BEDDING AND ENCASING

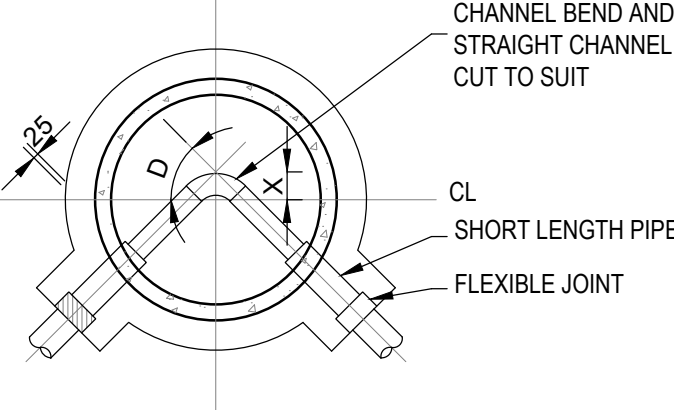


PLAN OF 90° BRANCH AND CONNECTION



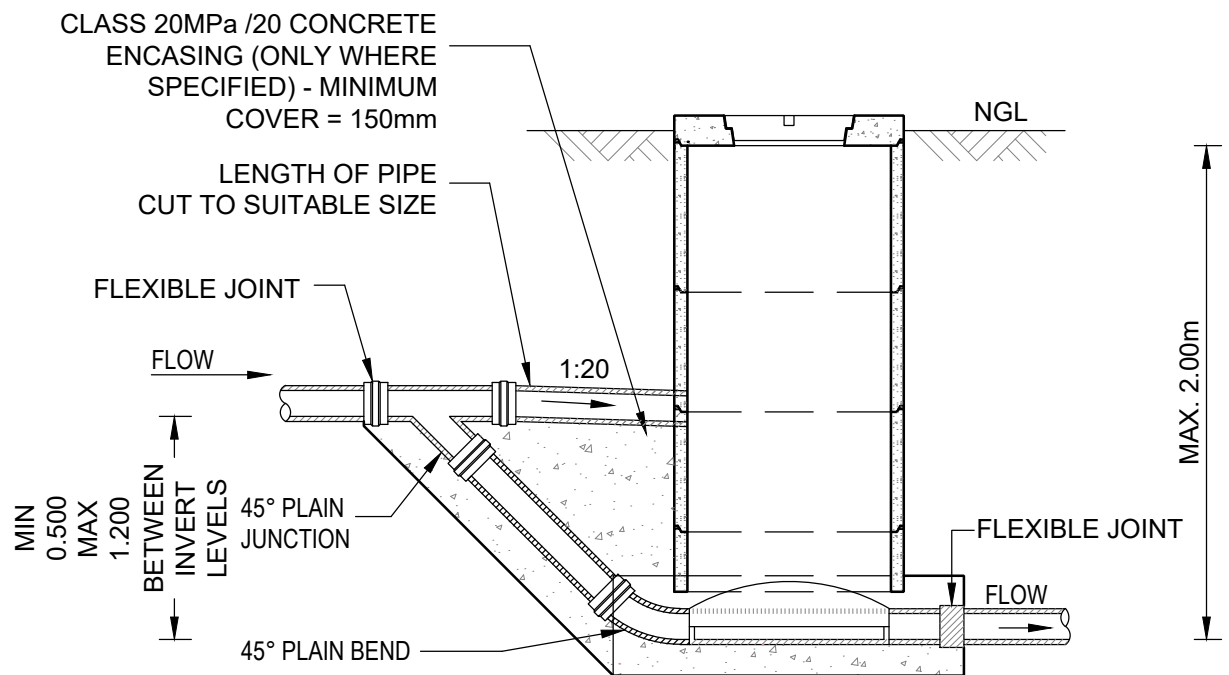
PLAN OF TERMINAL MANHOLES

DEF. ANGLE D	DISTANCE X
11.25°	50
22.5°	100
45°	140
67.5°	190
90°	230

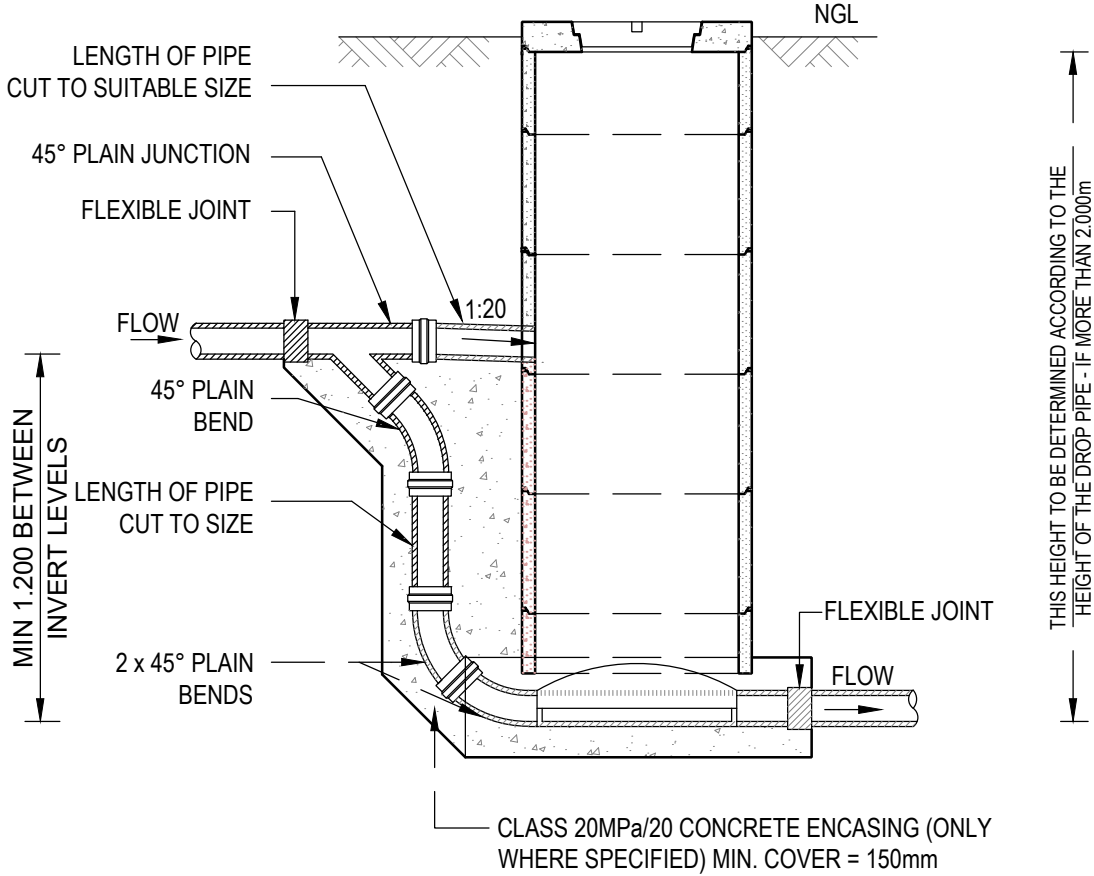


PLAN OF MANHOLE AT BENDS

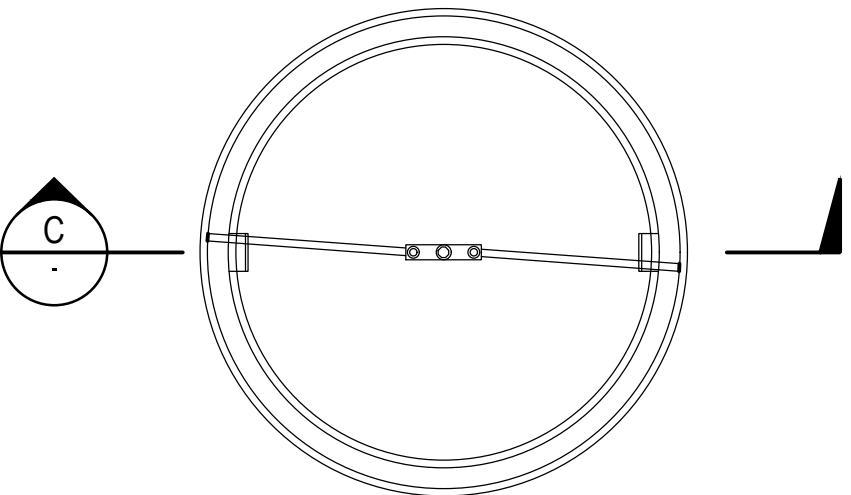
DETAIL R3:
TYPICAL CHANNEL LAYOUTS



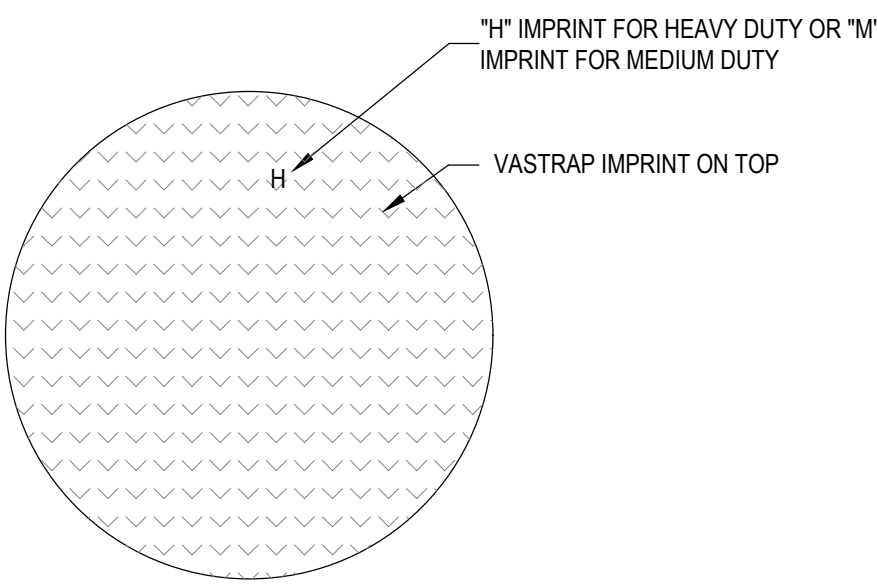
DETAIL OF RAMP AT MANHOLE



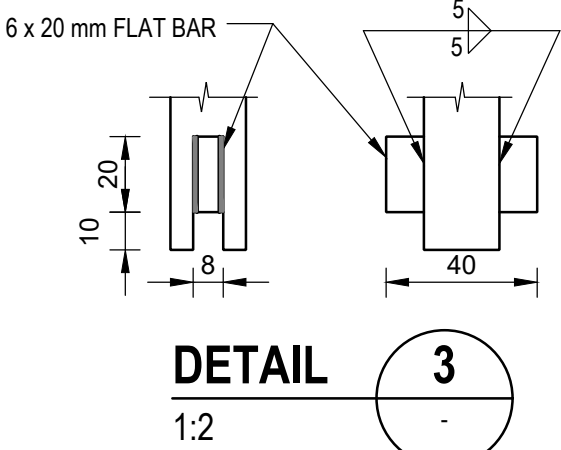
DETAIL R4:
DETAILS OF RAMP AND BACKDROPS



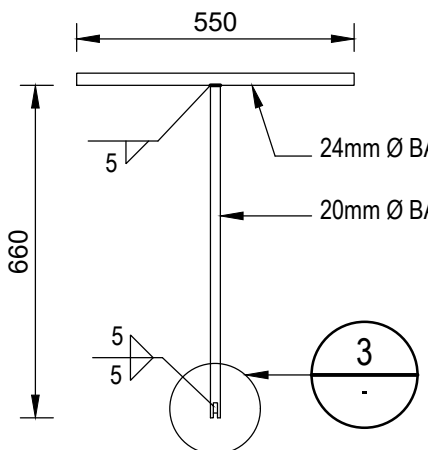
BOTTOM VIEW
SCALE 1:10



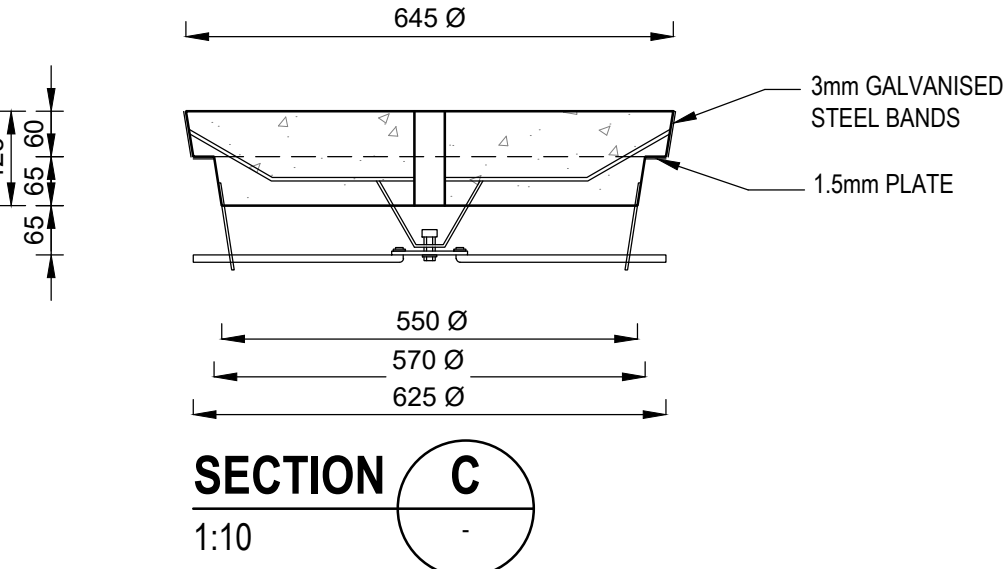
TOP VIEW
SCALE 1:10



DETAIL 3
1:2

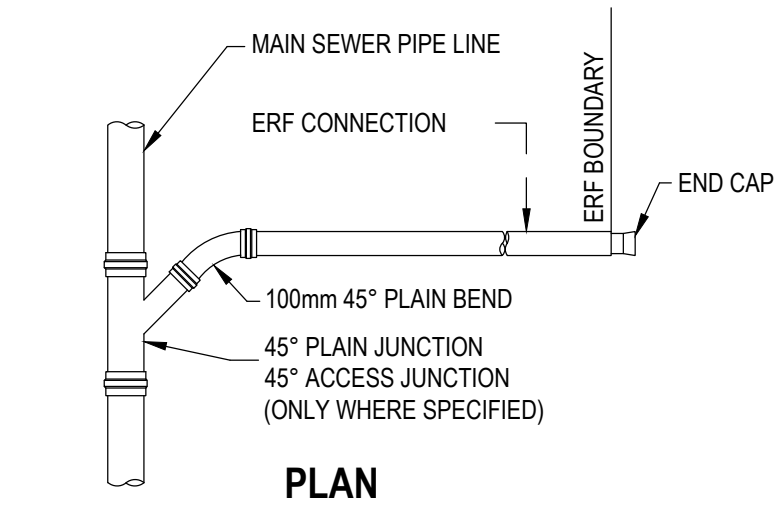


LOCKING AND LIFTING KEY
SCALE 1:15

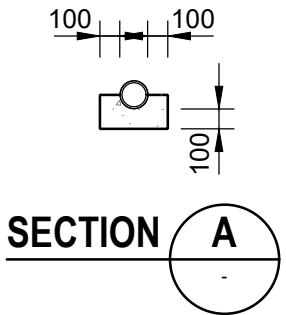


SECTION C
1:10

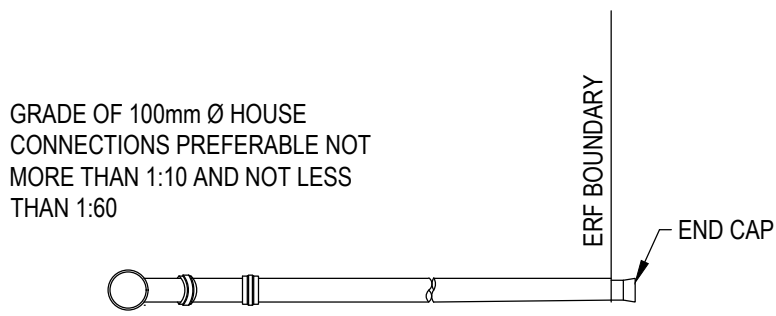
DETAIL R6:
DETAIL OF MANHOLE LID WITH LOCKING DEVICE



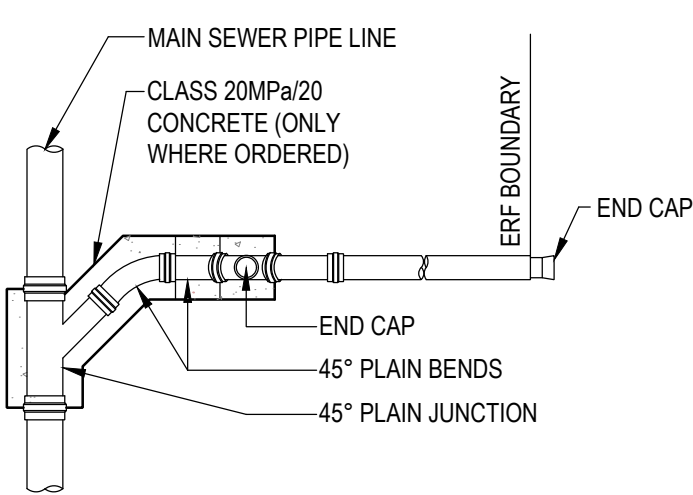
PLAN



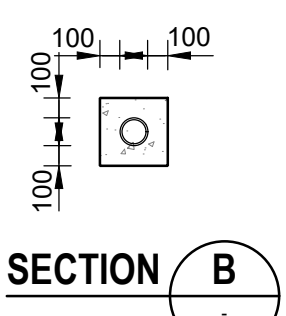
SECTION A



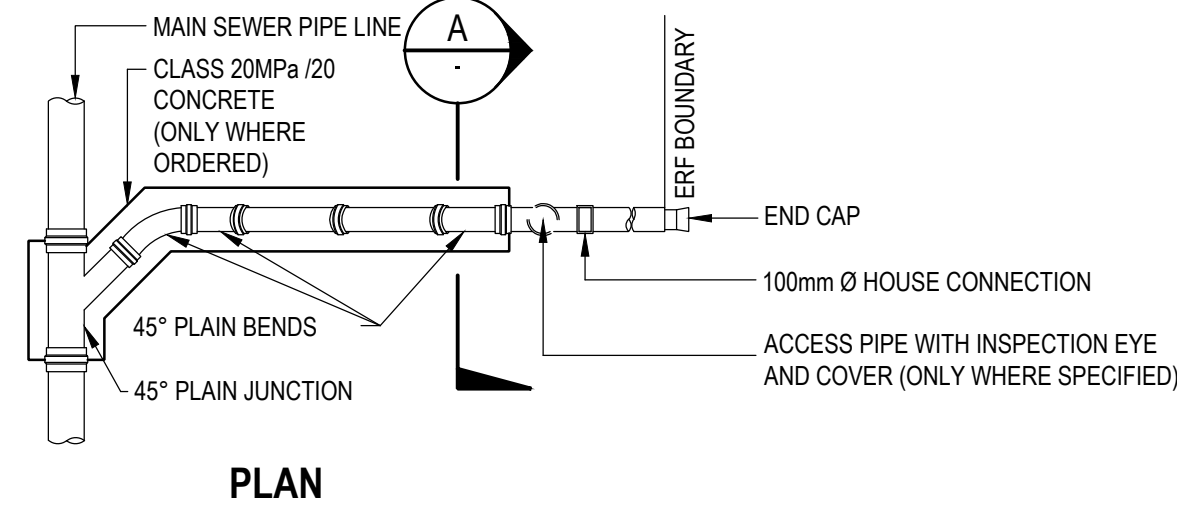
SECTION :
NORMAL CONNECTION



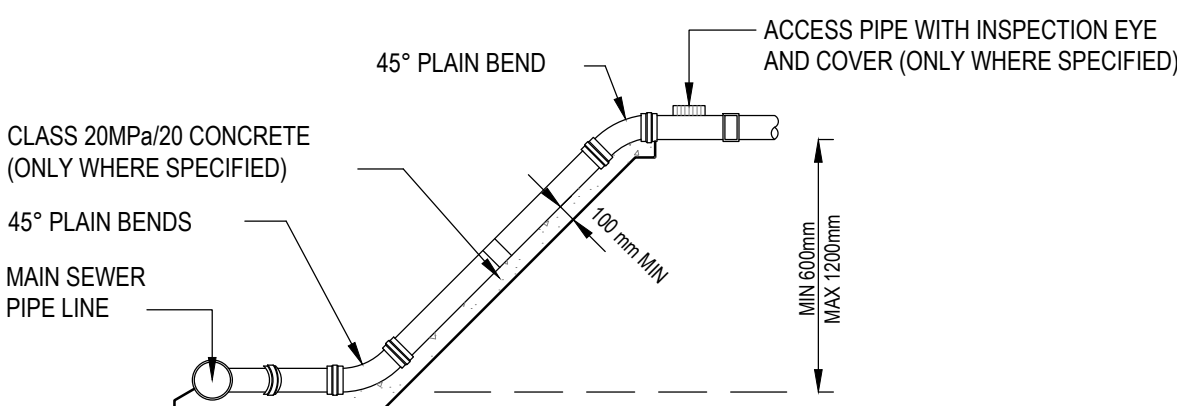
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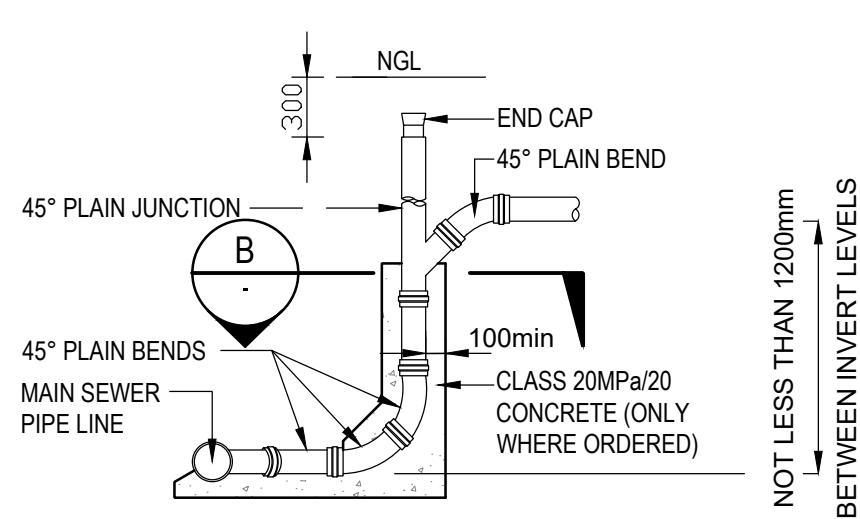
SECTION B



PLAN



SECTION :
RAMP CONNECTION



SECTION :
DROP PIPE CONNECTION

DETAIL R5:
DETAILS OF ERF CONNECTIONS

NOTES

- 1.) FLEXIBLE uPVC PIPES TO SANS 1601:2017
PIPES TO BE CLASS 40, HEAVY DUTY STRUCTURED WALL IN LENGTHS OF 6m MAX. AND EACH PIPE FITTED WITH INTEGRAL CUFF JOINTS. GUFF JOINTS TO USE A RUBBER COMPRESSION SEAL IN THE 2nd TROUGH FROM THE SPIGOT END.
- 2.) FLEXIBLE JOINTS TO SANS 1601:2017 AMENDED:
ALL NON STANDARD PIPE SECTIONS TO BE JOINED WITH DOUBLE & KIMBERLEY/ REPAIR COUPLINGS.
- 3.) FIELD TESTS:
a.) AIR TESTS ACCORDING TO CLAUSE 7.2 OF SABS 1200 LD MUST BE CARRIED OUT BETWEEN MANHOLES DURING THE FOLLOWING PHASES OF CONSTRUCTION:
i.) AFTER THE PIPES HAVE BEEN LAID.
ii.) AFTER THE INITIAL BACKFILLING HAS BEEN COMPLETED.
b.) THE AIR TEST IS ONLY AN INDICATION OF ACCEPTANCE OF A COMPLETED PORTION OF THE LINE AND IN ANY DISPUTE ARISING THE OUTCOME OF A WATER TEST WILL BE BINDING.
- 4.) TRENCHES:
a.) EXCAVATION AND BACKFILLING OF TRENCHES TO COMPLY WITH SABS 1200 DB.
b.) BEDDING OF PIPES TO COMPLY WITH SABS 1200 LB FOR FLEXIBLE PIPES.
c.) TRENCHES DEEPER THAN 2.0m TO BE EXCAVATED IN V-SHAPE FOR TOP 1.5m AS SAFETY.
PRECAUTION, ONLY ON INSTRUCTION OF THE ENGINEERAS DETERMINED ON SITE AND BY THE INSITU MATERIAL.
d.) SEWERS TO BE PROTECTED AT ROAD CROSSINGS AS SHOWN ON THE TYPICAL PLAN FOR PIPE BEDDINGS.
e.) TRENCHES TO BE PROTECTED FROM STROMWATER INFLOW.
- 5.) MANHOLES AND FITTINGS:
a.) ALL CONCRETE, BENCHING AND SEALERS SHALL COMPLY WITH SABS 1200 GA OR SABS 1200 LD AS APPLICABLE.
b.) PRECAST CONCRETE SECTIONS TO COMPLY WITH SABS 1294.
c.) CLASSES OF CONCRETE:
i.) PRECAST CONCRETE SECTIONS - 30/19.
ii.) BEDDING CRADDL - 15/19.
iii.) ALL OTHER CONCRETE - 25/19.
d.) CHANNELS IN THE MANHOLES TO BE LAID IN THE WET CONCRETE
FLOOR AND THE FIRST OR STARTER PRECAST SECTION OF 250mm BE PLACED AND THE BENCHING COMPLETED WITHIN 24 HOURS AFTER CASTING THE CONCRETE FLOOR NO DRIERS WILL BE PERMITTED.
e.) STEP IRONS SHALL NOT BE INSTALLED IN MANHOLES.
- 6.) CLEANING:
THE MANHOLE IN TOTAL BUT THE CHANNELS IN PARTICULAR MUST BE RUBBED AND CLEANED OUT PROPERLY TO A SMOOTH FINISH BEFORE THE MANHOLE WILL BE INSPECTED FOR APPROVAL.

REVISIONS			
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T	21-08-2024	ISSUED FOR TENDER	TW BARTLEMAN

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DATE :	21-08-2024	SCALE :	AS SHOWN

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TW BARTLEMAN
Pr. Eng : 20170117



CONTRACT ENGINEER



PROJECT

REFURBISHMENT OF VREDE /
THEMBALIHLE WASTEWATER
TREATMENT WORKS

TITLE
SEWER MANHOLE AND BENCHING
TYPICAL DETAIL

PLAN NO.	176-231	REVISION	T

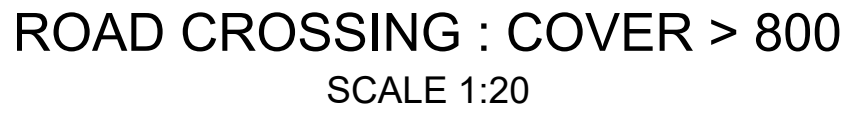
NOTES

PIPE BEDDING AND BLANKET MATERIAL SHALL
CONFORM TO SABS 1200 LB.

3.2 SELECTED FILL MATERIAL FOR SELECTED FILL BLANKET

a) MAXIMUM PARTICLE SIZE 30mm

b) PI MAX. 6



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LOCAL MUNICIPALITY

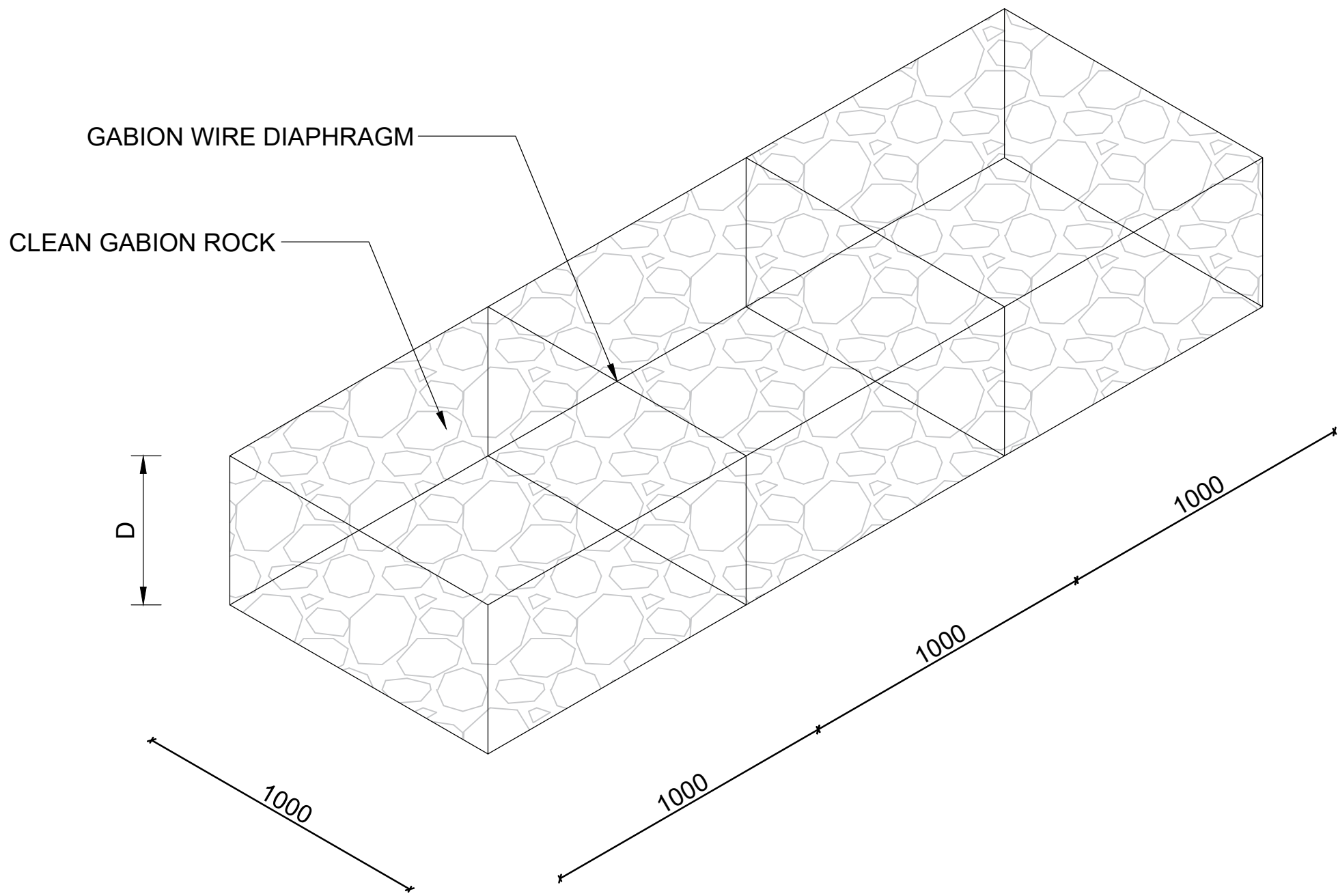


REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS

PLAN NO.	176-232	REVISION	T

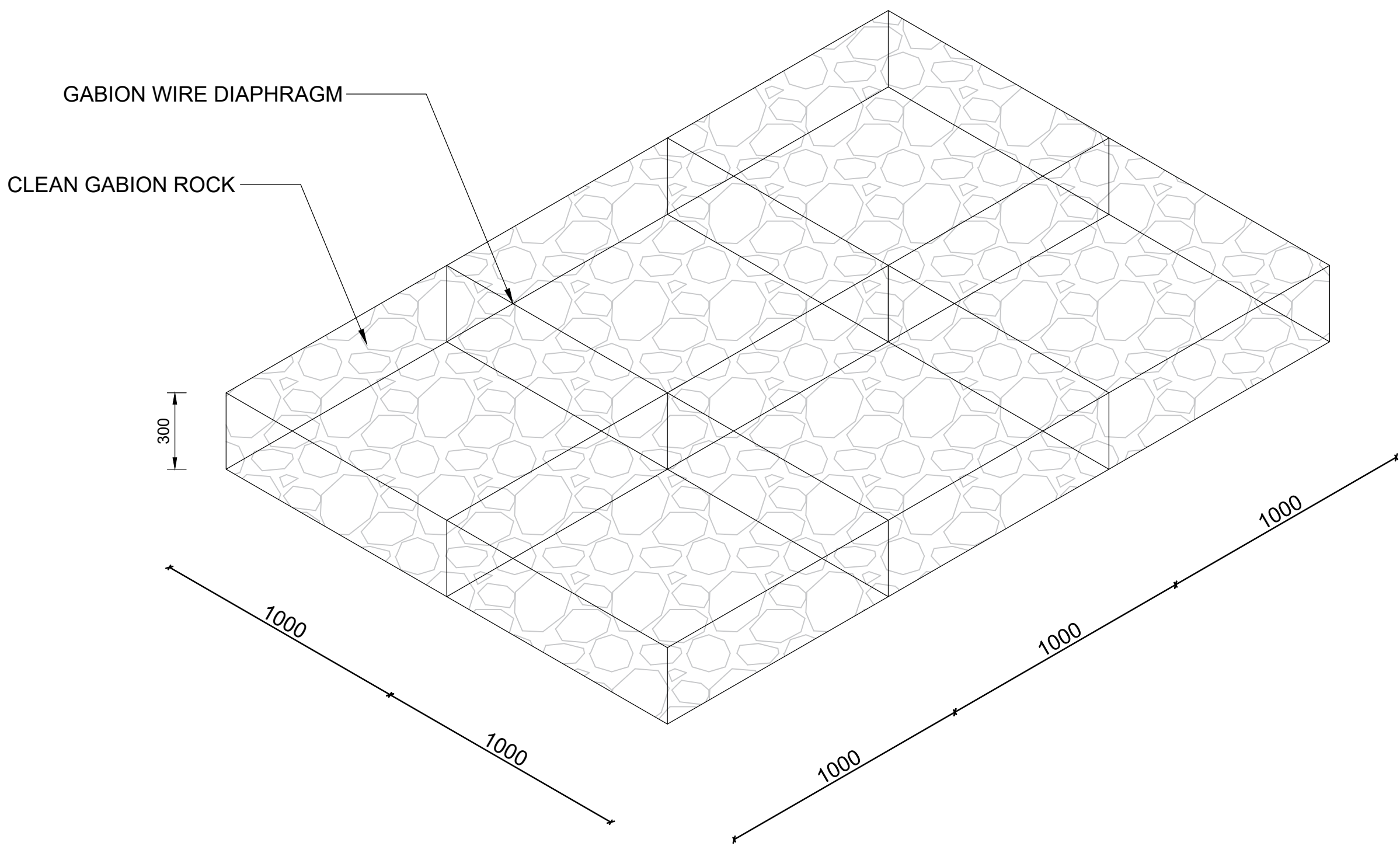
ROCK USED FOR THE FILLING OF CAGES		
DEPTH OF CAGES	ROCK SIZE (DIMENSIONS)	
	MIN. (mm)	MAX. (mm)
300	100	200
500	100	250
1000	100	300

ROCK USED FOR FILLING OF CAGES		
DEPTH OF GABION	MESH SIZE (mm)	WIRE DIAMETER (mm)
200mm TO 300mm	80mm x 100mm	2.5
500mm AND OVER	80mm x 100mm	2.7



GABION BOXES
N.T.S

DESIGN INFORMATION FOR GABIONS	
STANDARD SIZES FOR BOXES (mm)	
LENGTH (L)	1000mm
WIDTH (W)	1000mm
DEPTH (D)	TBD ON SITE
DIAPHRAGM SPACING	1000mm



GABION MATTRESSES
N.T.S

DESIGN INFORMATION FOR GABIONS	
STANDARD SIZES FOR MATTRESS (mm)	
LENGTH (L)	6000mm
WIDTH (W)	2000mm
DEPTH (D)	300mm

NOTES

- GABIONS:
 - ALL GABIONS AND GABION MATTRESSES SHALL HAVE BIDEM PLACED ON ALL SIDES WHERE IT IS TO BE COVERED WITH SOIL.
 - ALL EXPOSED FACES OF THE GABIONS SHALL BE MADE NEAT WITH EXPOSED FACE STONES AND HAVE A SMOOTH FINISHED SURFACE.

REVISIONS			
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TW BARTLEMAN
Pr. Eng : 20170117

.....
DATE



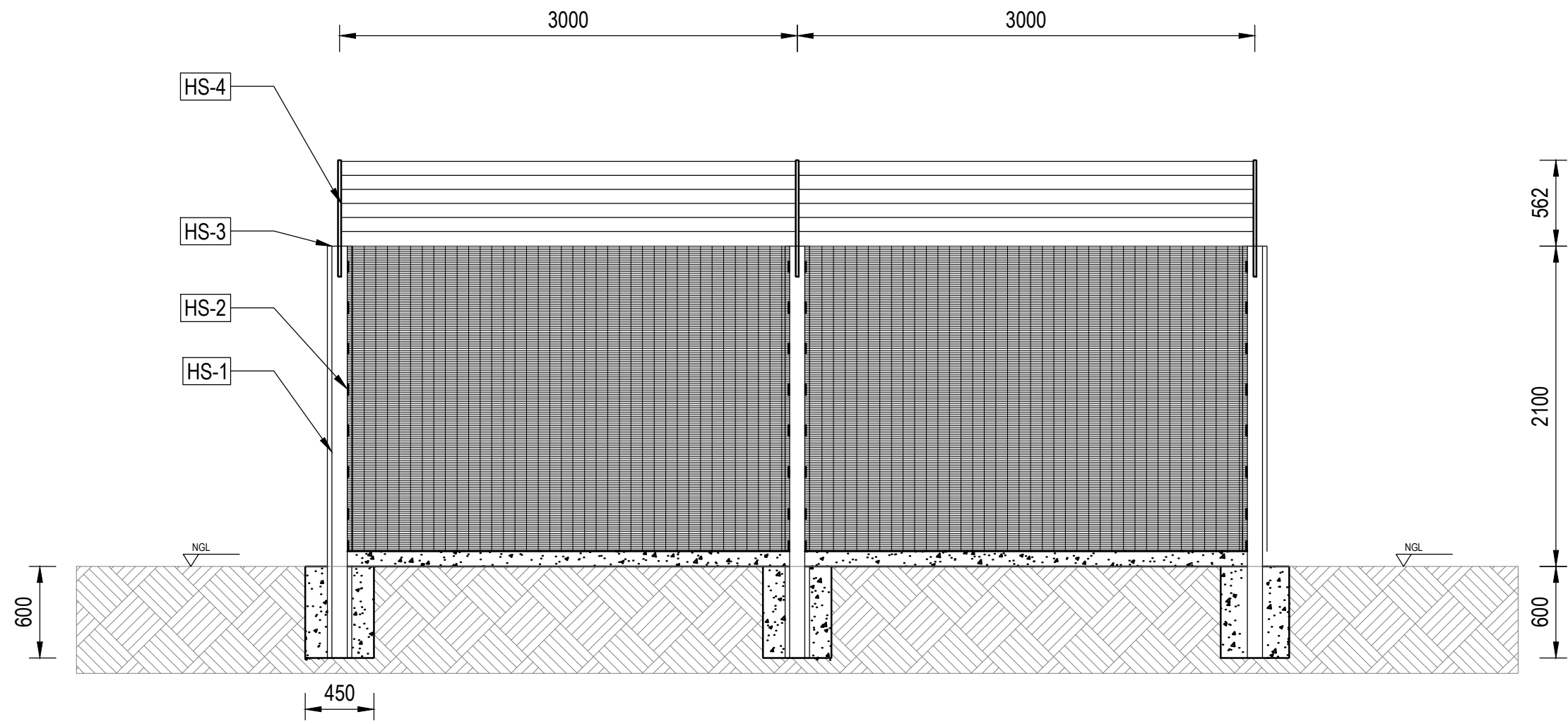
PROJECT

REFURBISHMENT OF VREDE /
THEMBALIHLE WASTEWATER
TREATMENT WORKS

TITLE

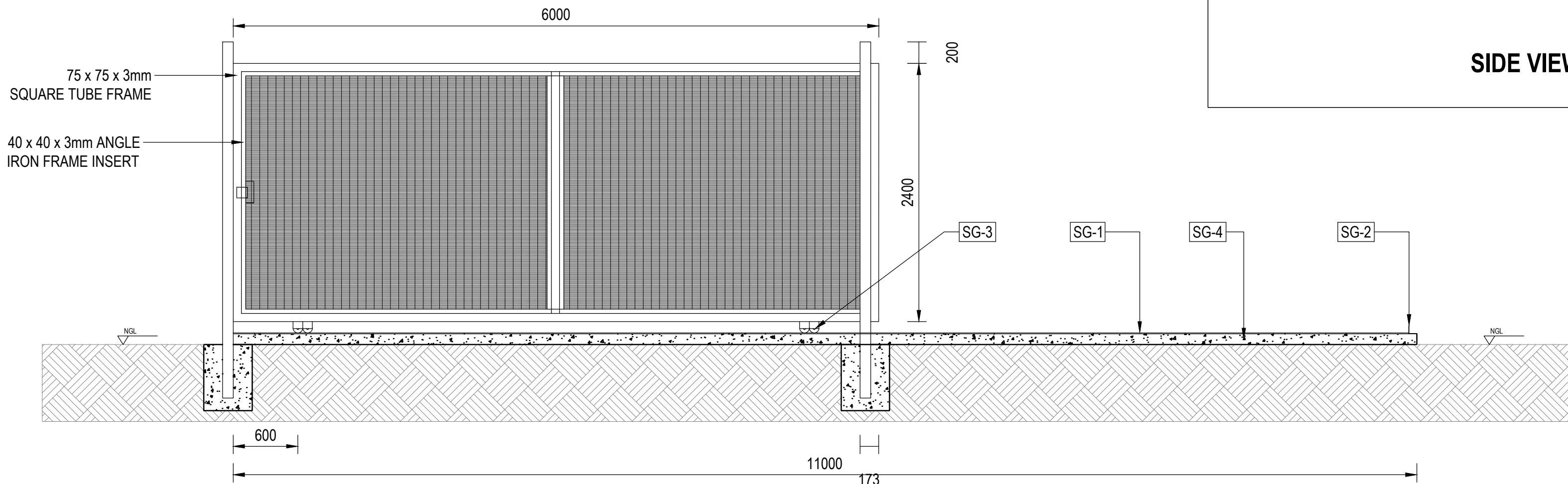
BASIC GABION LAYOUT

- HIGH-SECURITY FENCE NOTES:
- HS-1 : CLEARVU POST 100 x 100mm SQAURE TUBING
HS-2 : 16 x FIXATOR CLAMP PER PANEL (8 x SIDE)
HS-3 : SQUARE TUBING POLE END CAP
HS-4 : 20mm x 5mm WIRE FLAT BAR6 - ELECTRICAL WIRE WITH ISOLATORS
- ADDITIONAL NOTES:
- HIGH SECURITY CLEARVU PANEL WITH 4 x 50mm DEEP V-FORMATION
 - PANEL APERTURE - 76mm x 12mm (3/4 WIRE)
 - HS-2 CLAMP TO BE FIXED WITH M8-TECH SCREWS
 - GALVANIZED PROTECTIVE COATING



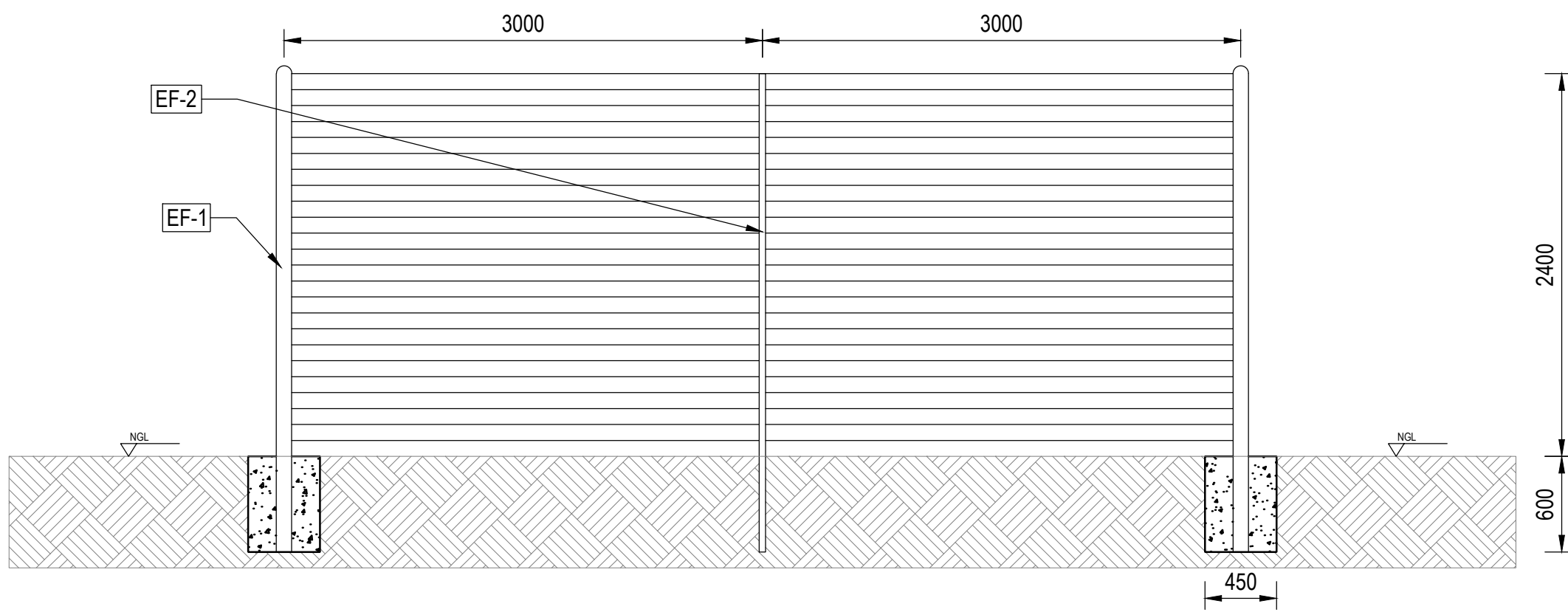
OUTSIDE SECURITY FENCE
1:30

- SLIDING GATE NOTES:
- SG-1 : 1.8mm ROUND BAR TRACK WELDED TO 50 x 50 x 1.6mm ANGLE IRON TO ANCHOR TO CONCRETE FOOTING
SG-2 : 75 x 75 x 3mm ANGLE IRON GATE STOP, ANCHORED INTO CONCRETE FOOTING
SG-3 : 100mm JAGUAR ROLLER GATE KIT WELDED TO UNDERSIDE OF SLIDING GATE FRAME
SG-4 : 300 x 100mm CONCRETE FOOTING FOR SLIDING GATE TRACK
- ADDITIONAL NOTES:
- HIGH SECURITY CLEARVU PANEL WITH 4 x 50mm DEEP V-FORMATION
 - PANEL APERTURE - 76mm x 12mm (3/4 WIRE)
 - HS-2 CLAMP TO BE FIXED WITH M8-TECH SCREWS
 - GALVANIZED PROTECTIVE COATING

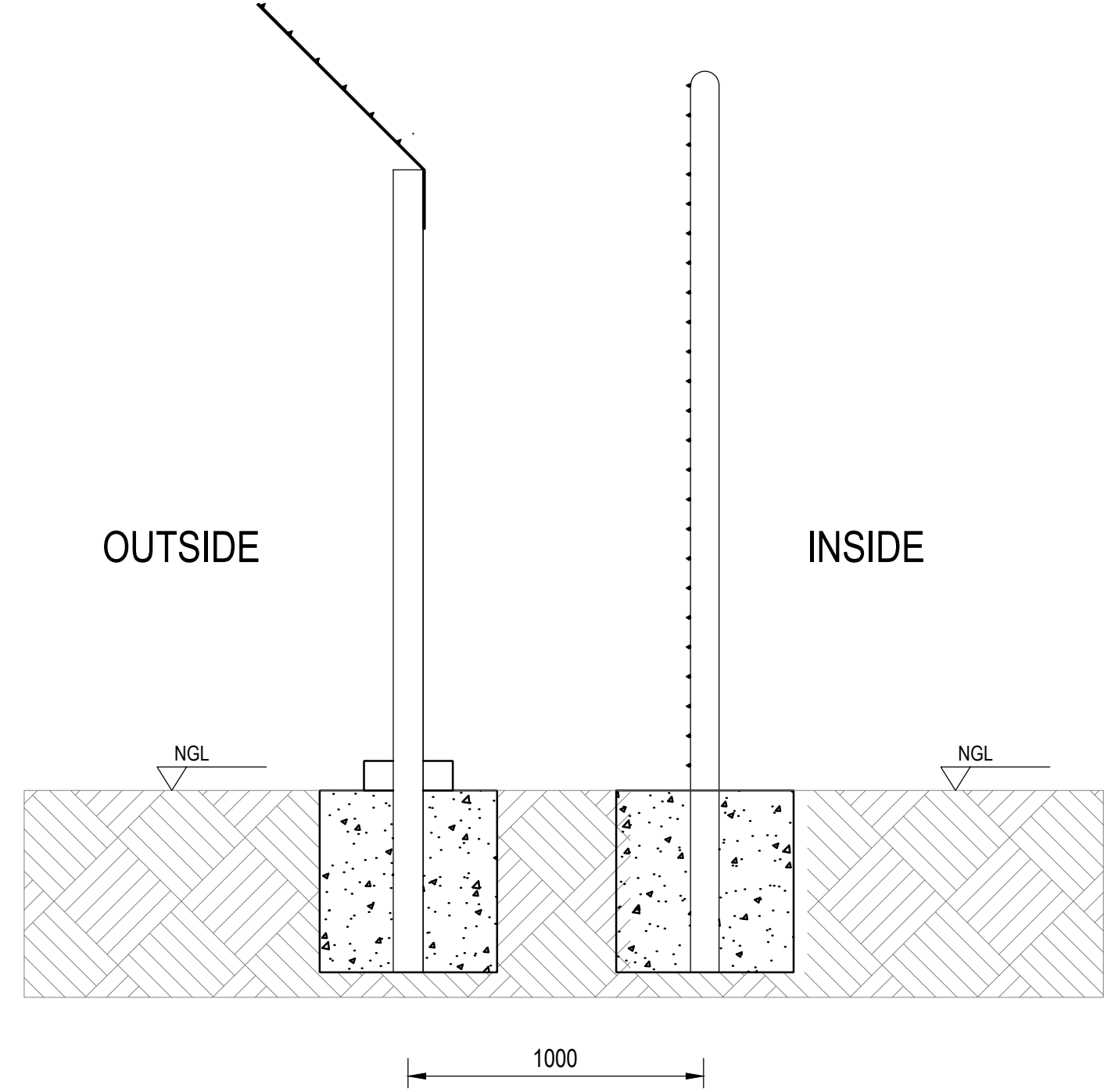


SLIDING GATE
1:30

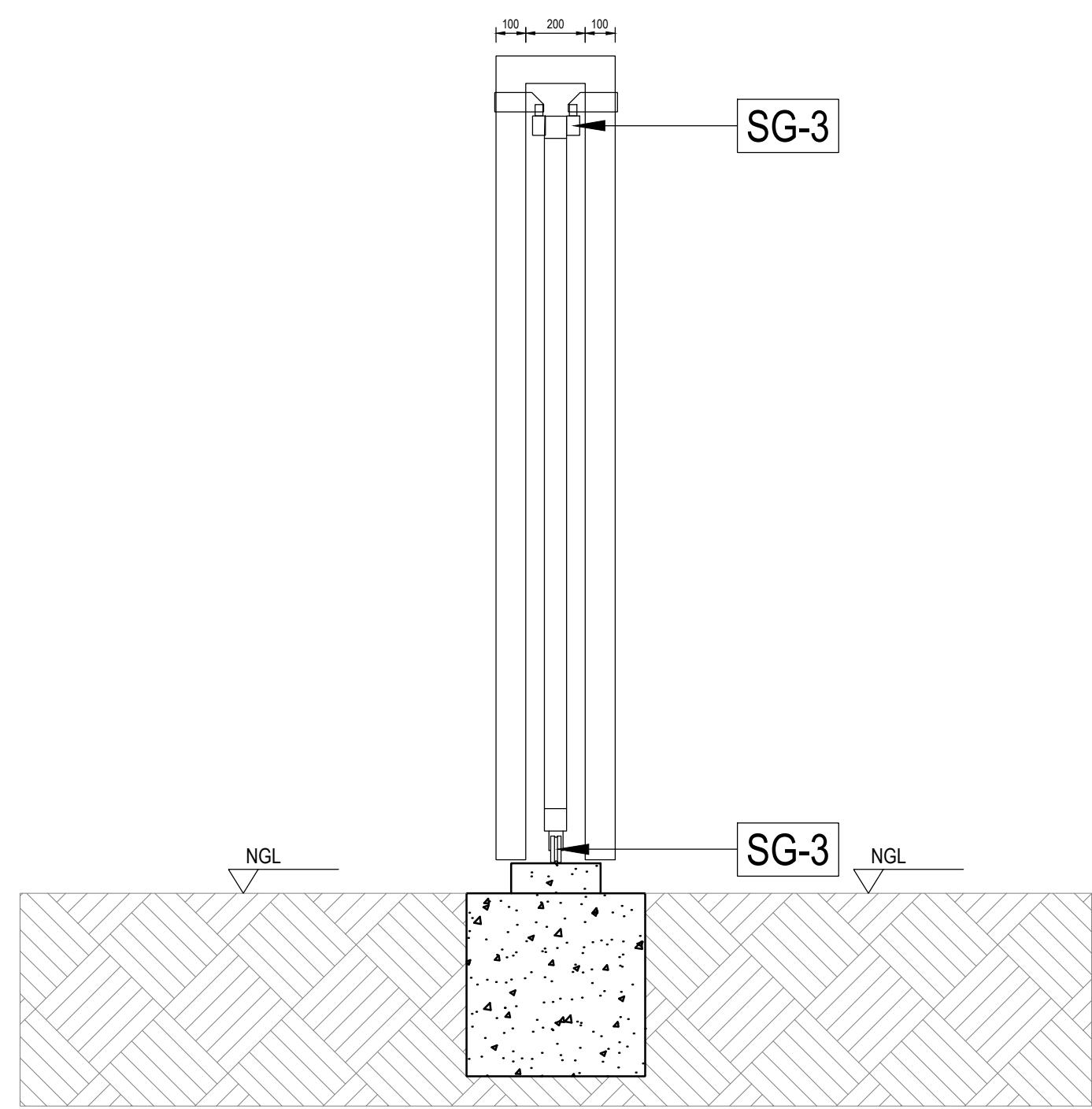
- ELECTRICAL FENCE NOTES:
- EF-1 : INLINE TENSION POST/STAYS 96mm x 2mm POLES 24 x WIRE FENCE, 100mm INTERVAL HOLES WITH FOR S-HOOKS & TENSIONERS
EF-2 : Y-STANDARD WITH ROUND HOLE



INSIDE SECURITY FENCE
1:30



SIDE VIEW OF FENCES
1:20



SIDE VIEW SLIDING GATE
1:20

NOTES

- FENCE FOOTINGS TO BE 15/19 MPa CONCRETE
- CONCRETE MUST HAVE BEVELLED EDGES
- CADASTRAL BEACONS MAY NOT BE TAMPERED WITH UNDER NO CIRCUMSTANCES
- ALL STEEL MEMBERS TO BE HOT DIPPED GALVANIZED WITH A 85 MICRON COATING IN ACCORDANCE WITH SABS 263

REVISIONS

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CONSULTING ENGINEER
TW BARTLEMAN
Pr. Eng : 20170117

DATE

CLIENT


PHUMELELA LOCAL MUNICIPALITY

CONTRACT ENGINEER


AFRICAN
ENGINEERING & CONSTRUCTION SOLUTIONS

PROJECT

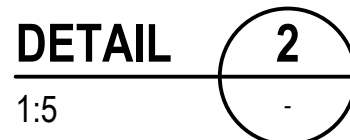
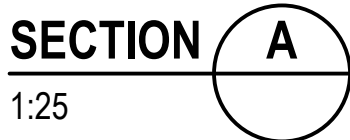
REFURBISHMENT OF VREDE /
THEMBALIHLE WASTEWATER
TREATMENT WORKS

TITLE

TYPICAL SECURITY FENCE
DETAIL

PLAN NO. 176-650

REVISION T



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DATE : 21-08-2024		SCALE : AS SHOWN	
..... CONSULTING ENGINEER TW BARTLEMAN <i>Pr. Eng : 20170117</i> DATE			
CLIENT  PHUMELELA LOCAL MUNICIPALITY			
CONTRACT ENGINEER  AFRICAN ENGINEERING & CONSTRUCTION SOLUTIONS			
PROJECT REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS			
TITLE SMALL ROOF STRUCTURE			
PLAN NO.		REVISION	
176-651		T	



C4.2: SITE INFORMATION

C4.2.1 Surveys / Beacons

The Bidder is to note that all survey control and beacons are based on localized grid positions and levels.

The details for the relevant survey control will be issued to the successful contractor at the commencement of the contract.

C4.2.2 Accommodation, Water and Electricity

The Bidder is to refer to Part **C3.1** of this document for pertinent information regarding the requirements for accommodation, water and electricity.

C4.2.3 Photographic Information of WWTW

Photographic information is included in this bid document. Refer to Part **C5.1**.

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



PHUMELELA LOCAL MUNICIPALITY

BID NUMBER : PLMT 24-25/01

**APPOINTMENT OF A CONTRACTOR FOR THE REFURBISHMENT OF
VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS**

THE CONTRACT: PART C5 **PART 5 (OF 5): ANNEXURES**

CONTENTS

C5.1	Health & Safety Specification

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C5.1: HEALTH & SAFETY SPECIFICATION

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

**REFURBISHMENT OF VREDE /
THEMBALIHLE WASTEWATER
TREATMENT WORKS**

OHS SPECIFICATION

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1. **Background**

The Phumelela Local Municipality is a Category B municipality situated within the Thabo Mofutsanyana District in the Free State Province. The Municipality consists of three towns, namely Vrede, Warden and Memel. The study area is in Vrede/ Thembelihle and include the Vrede Wastewater Treatment Works (WWTW). The coordinates of the Vrede WWTW are 27° 23' 59" S, 29° 10' 52" E.

Vrede/ Thembelihle WWTW Locality

The following figure shows the location of Vrede/ Thembelihle WWTW:

The Plant consist of the following unit treatment infrastructure:

- a. Inlet works, with one coarse hand screen and two grit removal channels
- b. One large primary sedimentation pond.
- c. Two bio-filters.
- d. Two secondary settling tanks and / or clarifiers.
- e. One pump station housing different pump sets for all activities on site.
- f. Two Maturation Ponds.
- g. Sludge drying beds.
- h. Four oxidation ponds.
- i. One chlorination building, including contact channels.

The existing infrastructure at the Bio-Filter Module has a conservative treatment capacity of 1.6 Ml/day Average Dry Weather Flow (ADWF).

2. Scope

The scope of works includes:

- The complete supply, refurbishment & repair, deliver, install, commission and upholding during the operational and retention period, of the fencing of the facility (pump stations and wastewater treatment works).
- The draining, cleaning, and dredging of any civil water holding or other structure, part of the pump stations and wastewater treatment works.
- The complete supply, refurbishment & repair, deliver, install, commission and upholding during for the 12-month defects liability period of the access and safety equipment for the structure and/or building, part of the pump stations and wastewater treatment works.
- The complete draining, cleaning, dredging, un-blocking, refurbishment & repair, commission, and up-holding during for the 12-month defects liability period, of all "sub-soil" pipelines, connecting main structures for the handling of the hydraulic flow, part of the pump stations and wastewater treatment works.
- The refurbishment, repair, replacement, commission, and up-holding during for the 12-month defects liability period of the civil structures, handling or treating the hydraulic flow, part of the pump stations and wastewater treatment works.
- Include the supply, deliver, repair maintenance and up-holding during for the 12-month defects liability period of the buildings (Top Structures), part of the pump stations and wastewater treatment works

3. Definitions

- **Act:** means the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)
- **Client:** **Phumelela Municipality**
- **Client's Health and Safety Agent:** **To be announced**
- **Competent person:** means any person having the knowledge, training, experience, and qualifications specific to the work or task being performed. Provided that where appropriate qualifications and training are registered in terms of the provisions of the South African Qualifications Authority Act, 1995 (Act no 58 of 1995), those qualifications and training must be regarded as the required qualifications and training; or any person declared competent by an assessor or institution accredited by the SA National Accreditation System (SANAS).
- **Construction work:** means any work in connection with—
 - ✓ the construction, erection, alteration, renovation, repair, demolition or dismantling of or addition to a building or any similar structure.
 - ✓ the construction, erection, maintenance, demolition or dismantling of any bridge, dam, canal, road, railway, runway, sewer, or water reticulation systems: or the moving of earth, clearing of land, making of excavations, piling or any similar civil engineering structure or type of work.
- **Contractor:** means an employer, as defined in section 1 of the Occupational Health and Safety Act, who performs construction work and includes principal contractors.
- **Hazard identification:** means the identification and documenting of existing or expected hazards to the health and safety of persons, which are normally associated with the type of construction work being executed or to be executed.
- **Health and safety file** means a file or other record in permanent form, containing the information required as contemplated in these regulations.
- **Health and safety plan** means a documented plan, which addresses hazards identified and includes safe work procedures to mitigate, reduce or control the hazards identified.
- **Health and safety specification** means a documented specification of all health and safety requirements pertaining to the associated works on a construction site, to ensure the health and safety of persons.
- **HCS:** Hazardous Chemical Substances
- **MSDS:** Material Safety Data Sheet
- **PPE:** Personal Protective Equipment

- **Principal contractor:** means an employer who performs construction work and is appointed by the client to be in overall control and management of a part of or the whole of a construction site.
- **“Subcontractor”** the principal contractor may appoint subcontractors. Wherever used, “subcontractors” shall have the same meaning as “contractor” as defined in the Construction Regulations. The requirements of the Act and the Construction Regulations shall “*mutatis mutandis*” apply.
- **Risk assessment:** means a program to determine any risk associated with any hazard at a construction site, to identify the steps needed to be taken to remove, reduce or control such hazard.
- **Structure:** means any building, steel or reinforced concrete structure.
 - ✓ Any railway line or siding, bridge, waterworks, reservoir, pump, pipe or pipeline, electrical structure, cable, sewer, sewage works, fixed vessel, road, drainage works, dam, wall, mast, tower, tower crane, bulk mixing plant, pylon, surface and underground tank, earth retaining structure, or any structure designed to preserve or alter any natural feature and any other similar structure.
 - ✓ Any false work, scaffolding or other structure designed or used to provide support or means of access during construction work; and
 - ✓ Any fixed plant in respect of construction work which includes installation, commissioning, decommissioning, or dismantling and where any such activity involves a risk of a person falling
- **Designer:** means a competent person who prepares a design.
 - ✓ checks and approves a design.
 - ✓ arranges for a person at work under his or her control to prepare a design, including an employee of that person where he or she is the employer.
 - ✓ or designs temporary work, including its components; an architect or engineer contributing to, or having overall responsibility for a design.
 - ✓ a building services engineer designing details for fixed plant.
 - ✓ a surveyor specifying articles or drawing up specifications; a contractor carrying out design work as part of a design and building project; or an interior designer, shopfitter, or landscape architect.
- **Engineer”** means the Engineer as defined in the Condition of Contract. In terms of the Construction Regulations, the Engineer may act as Agent on behalf of the Employer provided the Engineer is competent in the discipline.
- **Construction manager:** means a competent person responsible for the management of the physical construction processes and the coordination, administration, and management of resources on a construction site.
- **Construction site:** means a workplace where construction work is being performed: **Vrede/ Thembelihle WWTW**

4. Construction work permit

The appointed OHS agent will apply for a construction work permit on behalf of Letsemng Municipality. The application will be submitted to the provincial director 30 days before the REFURBISHMENT OF THE VREDE / THEMBELIHLE WASTEWATER TREATMENT WORKS (WWTW). The application shall be done by using the Annexure 1. With the annexure 1 the client will submit a copy of the:

- ✓ Health and safety specifications
- ✓ Health and safety plan
- ✓ Baseline risk assessment
- ✓ Any other documents required by the provincial director

Once the construction work permit is obtained and a site-specific number for REFURBISHMENT OF THE VREDE / THEMBELIHLE WASTEWATER TREATMENT WORKS (WWTW). have been issued to the client, the client shall issue a contractor with a copy of the construction work permit.

The principal contractor shall ensure that:

- ✓ That a copy of the permit is kept on site
 - ✓ Conspicuously displayed the site-specific number at the main entrance of the site.
- The construction work permit with the site-specific number is only to be used for the REFURBISHMENT OF THE VREDE / THEMBELIHLE WASTEWATER TREATMENT WORKS (WWTW).

5. Occupational Health and Safety plan

5.1 Introduction

The principal contractor shall prepare the OHS plan as specified in Construction Regulation 7(1)(a) and the Phumelela Municipality occupational health and safety specifications.

The principal contractor shall demonstrate that he /she have a suitable sufficiently documented OHS plan as well as the necessary competencies, experience, and resources to perform the construction work safely. No site establishment or construction work shall commence before receipt by the principal contractor of approval of the OHS plan.

The OHS plan shall be submitted to the OHS CONSULTANTS who is acting as the OHS agent, **7 days** prior to submitting the application for a construction work permit to the department of labour.

Upon the health and safety agents' approval and receipt off the construction work permit the principal contractor shall immediately implement the OHS plan and any amendments and keep it in operation for the full duration of the contract. The OHS plan shall be reviewed as a minimum once a year or if there is:

- ✓ Changes in legislation
- ✓ Changes in design
- ✓ After an incident
- ✓ After a serious nonconformance was identified.
- ✓

The contractor shall indicate on the OHS plan:

- ✓ Revision
- ✓ Date revised
- ✓ Sections revised /amended/changed
- ✓ Full description of revision/amendment / changes

Once the OHS plan are revised, the contractor shall not remove the previous revision. The previous revision will be superseded and kept in the file as record. The new revision shall be signed by the CR 8(1), 8(5) and must be approved by the CR 5(5).

5.2 Preparation of the OHS Plan

The OHS plan shall be a fully detailed plan, specifying the framework for the OHS plan. The principal contractor must demonstrate that it has developed a suitable and sufficiently documented OHS plan for the REFURBISHMENT OF THE VREDE / THEMBELIHLE WASTEWATER TREATMENT WORKS (WWTW). Based on the scope of work. The contractor must also prove that he/she has the necessary competencies, experience, and resources to perform the construction work safely.

The principal contractor shall compile an OHS File as specified under 5.4 of these specifications that should be submitted for approval prior to site establishment or any construction work.

5.3 Contents of the OHS plan

The OHS plan shall include but not limited to the following:

- Principal contractor OHS Policy
- **Legal and other requirements:** Principal contractor must specify what legal and other requirements will be applicable to the construction process:
- **Hazard Identification and Risk Assessment:** The principal contractor must in detail demonstrate how, when, where what type of risk assessments and by who risk assessments will be conducted?
- **Objectives and targets:** Objectives and targets must be set and detailed description to be given how objectives and targets will be reached
- **Resources, Roles, and responsibilities:** Appointments, who will be appointed for what.
- **Competency training and awareness.** Detailed description of what training will take place, including induction, job specific training and external training.
- **Communication:** Types of communication that will take place. Meetings and frequency of meetings (OHS committee meetings / site meetings. Monthly reports.
- **Performance monitoring:** What types of monitoring would be done: Inspections/ PTO's etc.
- **Inspections:** Inspections, frequency of inspections a people responsible for inspections.
- **Incident Management and Investigation:** Who, when, why, where, and how **incidents** will be managed.
- **Audits:** Types of audits and frequency of audits
- **Signage:** Signage that will be used
- **Access control / Security**
- **Public Health and Safety**
- **Traffic Management and accommodation**
- **PPE Management**
- **First Aid arrangements**
- **Emergencies**
- **Management of subcontractors.**
- **Control of Documents**
- **Occupational Health and Safety budget**
- **Operational control:** This refers to the material, equipment and activities that will take place on site based on the scope of works and will be as follows:
 - ✓ Signage
 - ✓ Equipment transport to site. Delivery and offloading.
 - ✓ Construction employee facilities
 - ✓ Stacking and Storage
 - ✓ Housekeeping
 - ✓ Waste management
 - ✓ Construction vehicles and mobile plant
 - ✓ Hand tools
 - ✓ Temporary electrical installations
 - ✓ Electrical work
 - ✓ Use of portable electrical tools
 - ✓ Ladders
 - ✓ Scaffolding
 - ✓ Clearing and grubbing. Vegetation clearance
 - ✓ Excavations
 - ✓ Bedding and Backfilling
 - ✓ Lifting machines and lifting equipment
 - ✓ Lifting operations
 - ✓ Welding and flame cutting activities
 - ✓ Vessels under pressure
 - ✓ Grinding / Using circular saws
 - ✓ Steel fixing
 - ✓ Working in a fall risk position.
 - ✓ Scaffolding

- ✓ Tie into existing services
- ✓ Confined spaces
- ✓ Electrical and mechanical works.
- ✓ Adverse weather conditions
- ✓ Use and storage of flammable liquids
- ✓ Hazardous chemical substances
- ✓ Dangerous animals.
- ✓ Working close to water environments
- ✓ Lighting
- ✓ Ventilation
- ✓ Noise
- ✓ Covid 19
- ✓ Working in or with sewage / effluent
- ✓ Removing asbestos material.

5.4 OHS file

The OH&S file / files, opened in terms of Construction Regulation 5(1)(s) and CR 7(1)(b) shall be always kept on site. This shall be a file or permanent record containing information on aspects of the contract regarding OHS of any person who may be affected by the construction work.

The principal contractor shall appoint a suitably qualified person to prepare the file / files and to keep it up to date for the duration of the contract. The file shall include the following information but not limited to:

- Appointment – Principal contractor
- 37(2) Mandatory agreement between client and principal contractor
- Appointment – OHS Agent
- Client OHS specifications
- Client Baseline Risk assessment
- Principal contractor OHS plan and approval
- Construction Work Permit
- Letter of Good Standing
- Public liability insurance
- Copy of the Occupational Health and Safety Act
- Copy of Construction Regulations
- Copy of the COID Act
- Legal Register
- OHS Policy
- Organogram & Appointments & Competencies of appointed persons
- Employee management: Personal profiles / ID's / Medicals with annexure 3 attached.
- Risk Management: Risk assessment review register / method statements / risk assessments / safe operating procedures / planned task observations / daily safety task instructions.
- Training and communication. (Induction / toolbox talks)
- Minutes of meetings
- Monthly reports
- Inspections
- Incident management: Incident registers / Incident investigations forms & templates
- Emergency Management
- PPE management
- Management of Contractors
- Fall protection
- HCS
- Construction vehicles and mobile plant
- Lifting machines
- Temporary works

- Traffic management
- Waste management
- Occupational Hygiene surveys
- COC's (Certificate of compliance)

6. OHS Policy

- ✓ The principal contractor shall prepare a policy document concerning the protection of the health and safety of his employees at work, including a description of his organization and the arrangements for carrying out and reviewing that policy.
- ✓ A copy of the policy shall be signed by the CEO of the principal contractor and kept in the OHS file.
- ✓ A copy of the policy shall be displayed in eating areas, notice boards and offices.
- ✓ The OHS policy shall form part of the induction and communicated to all employees.

7. Hazard Identification and Risk Assessment

7.1 Baseline risk assessment

A Baseline risk assessment was drafted by a Client OHS Agent as prescribed by Construction Regulation 5(1) and will be issued to the principal contractor. The Baseline risk assessment shall be reviewed as required and re-issued to the principal contractor.

The following risk assessment methodology was used to evaluate the risks and hazards:

Risk Assessment Methodology	
Likelihood	Weight Number
Might well be expected or inherently dangerous	10
Quite possible	6
Unusual but possible	3
Only remotely possible	1
Exposure	
Continuously or inherently dangerous	10
Daily (few times per day)	6
Weekly (few times per week)	3
Monthly (few times per month)	2
Annually or less often	1
Severity	
Irreversible effect	5
Severely harmful	4
Harmful	3
Slightly Harmful	2
Minimal effect	1
Risk Classification	
Very High Risk	200 - 500
High Risk	100 - 200
Medium Risk	50 - 90
Low Risk	0 - 50

The following significant risks and hazards have been identified

Hazard / Risks	Risk Rating	Significance
Competency and experience of contractors	300	Very high risk

Not complying with legal and other requirements.	300	Very high risk
Working inside deep excavations	300	Very high risk
Working in confined spaces	300	Very high risk
Unskilled workers	180	High risk
Transportation of employees.	180	High risk
Transportation, delivery and offloading of material and equipment to site.	180	High risk
Lifting machines, lifting equipment, and lifting operations.	180	High risk
Moving, placing bedding / backfilling material on the edges of excavated areas (<i>big possibility that sidewalls can collapse</i>)	180	High risk
Tie into existing services	180	High risk
Electrical and mechanical works	180	High risk
Installation of interconnecting pipework	180	High risk
Working in a fall risk position	180	High risk
Building and working on scaffolding	180	High risk
Improvement of existing services.	180	High risk
Inadequate access and egress routes to/from site	180	High risk
Insufficient emergency evacuation and response plans	180	High risk
Clearing and Grubbing: Dangerous snakes and bees.	180	High risk
Working with or in leaking sewage / effluent.	144	High risk
Insufficient health and safety budget.	144	High risk
Welding and flame cutting operations.	144	High risk
Grinding machines and grinding discs.	144	High risk

7.2 Risk assessment process

The overall all risk management process shall include but not limited to:

- ✓ Risk assessment review register
- ✓ Method statements for all tasks
- ✓ Issue based (task specific risk assessments)
- ✓ Safe operating procedures / Safe working procedures
- ✓ Daily safety task instructions
- ✓ Planned task observations

7.3 Risk assessment review register

The principal contractor and all contractors shall ensure that a risk assessment review register is implemented and maintained. The risk assessment review register shall include the following:

- ✓ Risk assessment number
- ✓ Risk assessment name
- ✓ Date: (*When risk assessment was developed*)
- ✓ Revision number
- ✓ Description of revision

7.4 Method statements

The principal contractor shall ensure that during any construction work or work associated with the aforesaid construction work; ensure that a task specific method statement is undertaken by a competent person. Preferably the appointed 16(1), CR 8(1), CR 8(2), or the CR 8(7). Method statements shall be communicated to all employees involved in the task before commencement of the task.

7.4.1 All method statements shall indicate:

- ✓ Name of Method statement
- ✓ Project name
- ✓ Date
- ✓ Revision
- ✓ Revision date
- ✓ Must be signed off by the CR 8(1), CR 8(7), and CR 8(5)

7.5 Issue Bases (Task Specific) Risk Assessments

The principal contractor shall ensure that during any construction work or work associated with the aforesaid construction work; ensure that a task Specific risk assessment is undertaken by a competent appointed person. These risk assessments shall be communicated to all employees involved in the task before commencement of the task.

7.5.1 All issue-based risk assessments (task specific risk assessments) must indicate:

- ✓ Name of Risk Assessment
- ✓ Project name
- ✓ Date of risk assessment
- ✓ Revision
- ✓ Revision date
- ✓ Must be signed off by the CR 8(1), CR 8(7), and CR 9(1)

7.5.2 The issue-based risk assessments (task specific risk assessments) should clearly stipulate the:

- ✓ Hazards identified
- ✓ Analyzed Risks
- ✓ Evaluation of risks – Risk assessment matrix should clearly indicate how risks are assessed.
- ✓ Controls

- ✓ Once the risks have been evaluated and the significance of the risks has been identified it is important that controls are implemented based on the hierarchy of controls:

- ✓ Eliminate
- ✓ Substitute
- ✓ Engineering controls
- ✓ Administrative controls
- ✓ PPE

7.5.3 Safe operating procedures (SOP's) / safe working procedures (SWP'S) shall be generated based on the task specific risk assessments and communicated to all employees. Planned task observations (PTO's) shall be generated based on the SOP's /SWP's. PTO's must be conducted weekly by supervisors; safety officers and OHS reps.

7.6 Continuous Risk Assessments

The principal contractor and all contractors shall provide and maintain a working environment that is safe and without risk to the health of all employees. The general awareness of hazards needs to be identified and controlled continuously to create a working environment that is as far as reasonably practicable safe and without risk. This is achieved by continuous (ongoing) risk assessments. DSTI's shall be conducted daily by the principal contractor and all other contractors on site. All DSTI's shall be signed off by the CR 8(1), CR 8(5), CR 8(7). An attendance register shall be completed and signed by all employees after the DSTI was communicated to them.

7.7 Risk assessment review

7.7.1 Method statements, risk Assessment and safe working procedures shall be reviewed after incidents or accidents or when:

- ✓ Designs are amended
 - ✓ New machines are introduced
 - ✓ Systems of work change or operations alter
 - ✓ Technological developments invalidate prior risk assessments
- All Risk Assessments must be indicated on a risk assessment review register and reviews to be indicated with dates and personnel responsible for reviews.

7.7.2 All documents used in the risk assessment process shall be marked with an approved or superseded stamp. If documents are live and in use it shall be marked as approved. If the document has been revised and the revision is no longer in use, it will be marked as superseded.

7.7.3 No superseded documents may be removed from the health and safety files or from site. Superseded documents shall be kept on record and be filed behind approved documents. It is imperative that all revisions are available and that previous revisions are superseded, and the latest revisions are signed by all responsible persons and approved.

8. Objectives and targets

Despite general objectives set by the principal contractor, objectives shall be developed to mitigate the top 10 significant risks identified during the risk assessment process

The principal contractor shall strive to:

- ✓ Maintain a Los Time Injury Frequency Rate (LTIFR) of 0.
- ✓ Zero fatalities
- ✓ Limit / avoid lost time injuries and occupational diseases.
- ✓ Create a safe working environment that is as far as reasonably safe and without risk to employees.
- ✓ Ensure that employees are fully aware of hazards and risks and controls to protect themselves.
- ✓ That loss due to incidents are limited.

9. Resources, roles, and responsibilities

9.1 Structure / Organogram

An organogram for the construction activity shall be included in the file and displayed in all offices, notice boards and eating areas. Where appointments are still to be made, these positions shall be reflected in the organogram and be populated once the positions have been filled. The organogram shall include but not limited to:

- ✓ CEO
- ✓ COO
- ✓ 16(2) Contracts Manager
- ✓ CR 8(1) Construction manager
- ✓ CR 8(2) Assistant construction manager
- ✓ CR 8(7) Construction supervisors
- ✓ CR 8(8) Assistant construction supervisors
- ✓ 16(2) Health and safety manager
- ✓ CR 8(7) Construction OHS officer
- ✓ 17(1) SHE reps
- ✓ GSR 3(4) First Aiders
- ✓ GAR 9 Incident Investigator
- ✓ CR 9(1) Risk Assessor
- ✓ CR 10(1)(a) Fall protection planner
- ✓ CR 12(1) Temporary works designer

9.2 Appointments

9.2.1 Construction Manager – CR 8(1)

The principal contractor shall appoint a full-time competent person as the construction manager to manage all the construction work on site, including the duty of ensuring occupational health and safety compliance. No construction manager appointed under sub regulation (1) may manage any construction work on or in any construction site other than the site in respect of which he or she has been appointed.

9.2.2 Assistant construction manager – CR 8(2)

Considering the size of the project, the contractor shall in writing appoint one or more assistant construction managers for different sections of the construction area.

9.2.3 Construction health and safety officer – CR 8(5)

Considering the size of the project the, the Principal Contractor shall appoint a full-time construction health and safety officers that are registered with the South African Council for Project and Construction Management Professions as an occupational health and safety officer. The full-time construction health and safety officers will report to a construction health and safety manager that is registered with the South African Council for Project and Construction Management Professions as an occupational health and safety manager. The Construction Health and Safety Manager shall visit the site once a month to assist the appointed OHS officers.

9.2.3 Construction Supervisors – CR 8(7)

The Construction manager shall in writing appoint construction supervisors responsible for construction activities and ensuring occupational health and safety compliance on the construction site.

9.2.4 Assistant construction supervisors – CR 8(8)

The principal contractor shall appoint one or more competent employees for different sections to assist the construction supervisor.

9.2.5 Risk Assessor – CR 9(1)

A competent risk assessor shall be appointed in writing to perform risk assessments before any work is commenced.

9.2.6 Incident Investigator – GAR 9(2)

A competent incident investigator shall be appointed in writing to appoint all incidents which must be recorded in terms of the General Administrative Regulations 9.

9.2.7 First Aider – GSR 3(4)

Where there are more than 10 employees employed the employer shall appoint a first aider in possession of a valid first aid certificate for every group up to 50 employees.

9.2.8 SHE Rep – OHSA 17(1)

Every employer who has 20 employees or more in his employment shall appoint a SHE representative for every 50 employees.

9.2.9 Other appointments

The principal contractor shall ensure that during any construction work or work associated with the aforesaid construction work to appoint competent employees as required by all legal and other requirements.

9.3 Competencies

The principal contractor shall ensure that the competency for each appointed person is proven by means of certificates or CV's. No appointments will be seen as operational without proof of competency. All appointments must be signed by the person designated to appoint employees and the designated appointed personnel.

The following health and safety competency would be required and should be facilitated by a registered training provider:

9.3.1 Construction Manager – CR 8(1)

- ✓ Safety for supervisors training course
- ✓ Hazard Identification and risk assessment (HIRA)
- ✓ Legal liability
- ✓ Incident investigation

9.3.2 Assistant construction manager – CR 8(2)

- ✓ Safety for supervisors training course
- ✓ Hazard Identification and risk assessment (HIRA)
- ✓ Legal liability
- ✓ Incident investigation

9.3.3 Construction health and safety officer – CR 8(5)

- ✓ NADSAM / SAMTRAC / NEHBOS / Equivalent
- ✓ Registered as Construction health and safety officer at SACPCMP
- ✓ Hazard Identification and risk assessment (HIRA)
- ✓ Legal Liability
- ✓ Excavation inspection course (*Safety officer will not be allowed be appointed as excavation supervisors/inspectors. The course will assist them to identify hazards better regarding excavation works.*)
- ✓ Confined space training

No health and safety officer or health and safety manager will be allowed on site if not registered with the SACPCMP. Conformation letters shall not be accepted.

9.3.3 Construction Supervisors – CR 8(7)

- ✓ Safety for supervisors training course
- ✓ Hazard Identification and risk assessment (HIRA)
- ✓ Legal liability
- ✓ Incident investigation

9.3.4 Assistant construction supervisors – CR 8(8)

- ✓ Safety for supervisors training course
- ✓ Hazard Identification and risk assessment (HIRA)
- ✓ Legal liability
- ✓ Incident investigation

9.3.5 Risk Assessor – CR 9(1)

- ✓ Hazard Identification and risk assessment (HIRA)

9.3.6 Incident Investigator – GAR 9(2)

- ✓ Incident Investigation level 3

9.3.7 First Aider – GSR 3(4)

- ✓ First Aid level 2 certificate. Received from the SA red Cross, ST John's or any organization approved by the chief inspector.

9.3.8 SHE Rep – OHSA 17(1)

- ✓ SHE Rep training course.
- ✓ Hazard Identification and risk assessment (HIRA)
- ✓ Incident investigation
- ✓ Working in confined spaces
- ✓ Excavation inspection course (*She reps will not be allowed be appointed as excavation supervisors/inspectors. The course will assist them to identify hazards better regarding excavation works.*)

9.3.9 Excavation supervisor.CR 13(1)(a)

- ✓ A background of a minimum experience of 6 years in civil engineering
- ✓ Minimum qualification: Diploma in civil engineering.

- ✓ Excavation inspection course
- ✓ The competencies and appointment of the excavation supervisor to be submitted to the geotechnical professionals for approval.

9.3.10 Confined space supervisor. GSR 5

- ✓ A background of a minimum experience of 6 years in civil engineering
- ✓ Minimum qualification: Diploma in civil engineering.
- ✓ Working in confined spaces training course
- ✓ No employees, engineers or specialist consultants shall be allowed to enter any confined spaces without a competency certificate provide by an external service provider for working in confined spaces.

9.3.11 Fall protection plan developer. CR 10(1)(a)

The principal contractor shall appoint a competent person that is full time on site to be responsible for the preparation of the fall protection plan.

9.3.12 Other appointments and training

All employees and appointed personnel shall be in possession of valid competency certificates to act in a specific capacity as indicated in all legal and other requirements.

10. Training

10.1 OHS Induction Training

✓ Principal Contractors OHS induction

The principal contractor shall ensure that all personnel involved on the project, including his own employees, visitors, sub-contractors, the designers, and their employees, undergo appropriate OHS induction training presented by a competent person before entering site or commencing construction work and no employee, sub-contractor or visitor shall be allowed to enter site without OHS Induction training.

The Contractor shall ensure that every employee or visitor on site shall always be in possession of proof of completing the OHS Induction training.

10.2 Job specific training will include but not limited to as applicable:

- ✓ Health and safety representative training
- ✓ First Aid training
- ✓ Firefighting training
- ✓ Emergency evacuation controller training
- ✓ Handling of dangerous snakes
- ✓ Operate construction vehicles and mobile plant
- ✓ Operating cranes
- ✓ Rigging training
- ✓ Hand tool training
- ✓ Covid 19 Exposure and controls
- ✓ Training in the use of PPE and its limitations
- ✓ Fall prevention and protection training
- ✓ All other training as determined during the HIRAC process
- ✓ Scaffolding training
- ✓ Temporary works training
- ✓ Working in confined spaces training
- ✓ Excavation inspection training
- ✓ Training to use portable x-ray machines

- ✓ Training to use soil moisture and density gauges.
- ✓ Using grinders
- ✓ Using of Portable Electrical equipment
- ✓ Use of welding and flame cutting equipment
- ✓ Stacking and storage supervision training
- ✓ Housekeeping training
- ✓ Traffic management and accommodation training.

11. Communication

11.1 Toolbox talks and DSTI's

Toolbox talks shall be done weekly. DSTI's shall be done daily by all contractors. Attendances are compulsory for all employees, sub-contractors and supervisors working on site. Attendance registers shall be completed and signed as proof.

11.2 OHS committee meetings

OHS committee meeting shall be held monthly, and minutes must be distributed to the SHE representative and SHE committee members. Minutes shall also be discussed in the toolbox talks by the safety representative. The following people shall be part of the safety committee meeting:

- ✓ Construction Manager (Site Agent)
- ✓ Construction works supervisors
- ✓ Assistant construction works supervisors
- ✓ Safety officers
- ✓ SHE Representatives
- ✓ Representatives of subcontractors
- ✓ SHE committee members
- ✓ CLO

11.3 Meetings

Technical meetings and progress meetings with the client shall take place monthly on site.

11.4 Visible Felt Leadership

Once a month the Construction manager, supervisors and contractor's supervisors shall have a safety walk. After the walk deviations shall be communicated and corrective and preventative actions shall be developed and implemented. Suggestions should be made to improve OHS and to ensure continual improvement. Attendance register shall be completed to indicate involvement from the construction manager, supervisors, contractor supervisors and OHS reps.

11.5 Monthly reports

Monthly reports applicable to the project shall be drafted and sent to the OHS agent by the 25th of each month.

- ✓ See attached annexure A that must be completed and submitted by the 25th of each month.

11.6 Notice boards

To ensure that employees are informed, notice boards shall be available at all eating areas and offices. The following information shall be displayed on notice boards but not limited to:

- ✓ OHS Policy
- ✓ Organogram
- ✓ First Aiders: Pictures with contact details
- ✓ Snake handler: Pictures with contact details
- ✓ Emergency Coordinator: Pictures and contact details

- ✓ Emergency team: Pictures and contact numbers
- ✓ SHE reps: Pictures and contact numbers
- ✓ Emergency evacuation plan
- ✓ Emergency telephone numbers
- ✓ Incident statistics
- ✓ Lost time injury frequency rates (LTIFR)
- ✓ Days without LTI's (lost time injuries)
- ✓ Hours without LTI's (lost time injury)
- ✓ OHS topic for the week (Toolbox talk for the week)

12. Performance monitoring and measurement

12.1 Planned Task Observations

The monitoring of the effectiveness of the risk assessments, safe work procedures and remedial and corrective actions measures taken after an accident or incident will be done by means of planned task observations. One PTO must be conducted weekly by Construction Manager, supervisors, safety officer and OHS reps.

12.2 General inspections

- ✓ Pre-used, monthly, daily, quarter, bi-annual and annual inspections shall be carried out by the principal contractor and contractors as required as by legal and other requirements.
- ✓ All registers to be properly completed and signed by responsible personnel.
- ✓ Deviations identified shall be documented, reported, and actioned.

12.3 Audits

12.3.1 External audits and inspections

Monthly OHS CONSULTANTS shall conduct one site verification inspection and one compliance audit. Detailed reports with pictures shall be generated and submitted to the contractor within seven days from the audit or the inspection. Two days after the audit or inspection the contractor shall issue OHS CONSULTANTS with a detailed action plan.

The action plan shall include but not limited to:

- ✓ Deviations identified
- ✓ Corrective actions
- ✓ Preventative actions
- ✓ Responsible persons
- ✓ Due date
- ✓ All action plans shall be signed by the appointed Construction manager and safety officer.

12.3.2 Internal audits

The principal contractor shall conduct monthly self-audits to identify gaps, shortcomings and to ensure continual improvement.

The principal contractor shall conduct monthly audit on all contractors. Action plans will be drawn up, discussed with subcontractors

Audit reports compiled during external audits, self-audits and audits on contractors shall be minted and discussed during the OHS committee meeting.

12.4 Medical Surveillance

Medical examinations must be done on all employees based on the exposure identified on the annexure 3 as specified in the Construction Regulations. The annexure 3 must be completed based on the scope of works and submitted to the occupational medicine practitioner /occupational health nursing practitioner. After the medical have been completed the occupational medicine practitioner /occupational health nursing practitioner must complete the following information on the annexure 3:

- ✓ Name and Surname
- ✓ Signature
- ✓ Address
- ✓ Practice number
- ✓ Date of assessment

The annexure 3 must be attached to all medical certificates of fitness. No employees will be allowed to perform any work on site if found unfit. Since the medical is only valid for one year the principal contractor and contractors must keep the duration of the project in consideration when developing the OHS budget.

Medicals shall be conducted:

- ✓ Before the start of a project
- ✓ During a project (Annually)
- ✓ Pre-placement – once an employee's scope of work and exposure changes.
- ✓ Exit medical – once the project is completed / contract is terminated / employee resigned.

The following employees must be declared medically fit without any conditions:

- ✓ Employees working at heights
- ✓ Driven machinery operator
- ✓ Crane operators
- ✓ Riggers
- ✓ Workers working in confined spaces
- ✓ Scaffold erectors and inspectors
- ✓ Employees working with portable electrical equipment.
- ✓ Employees working with x ray machines
- ✓ Employees working with soil density gauges.

If an employee was declared fit with prescribe restrictions and recommendations it is the responsibility of the employer to constantly monitor the employee. Based on section 14 of the OHS Act an employee that was declared fit with restrictions and recommendations is responsible to look after his own health and safety. This refers to taking medication when needed, using correct PPE prescribed and avoiding restricted areas that might have an influence on the health of an employee.

13. Incident / Accident Management

13.1 Recording and investigation of incidents

13.1.1 All incidents that occur, whether a near miss, first aid case, medical case, or section 24 incident, shall be recorded and investigated by a competent person as prescribed by the General Administrative Regulations 9.

Section 24 incidents must be investigated within 7 days by a competent person and be finalized as soon as possible. The findings of the investigation must be entered in to the annexure1. All records of the investigation must be examined during the OHS committee meeting and actions implemented and followed up to prevent reoccurrences.

During the investigation process, it is important that following processes are properly executed but not limited to:

- ✓ Access the situation
- ✓ Collect as much data as possible
- ✓ Analyze data properly
- ✓ Develop and implement remedial actions / Train employees on remedial actions
- ✓ Conduct audit to verify that remedial actions are implemented.

13.1.2 Revision of documents

All relevant documents shall be revised after accidents. These documents shall include but not limited to:

- ✓ Method statement
- ✓ Risk assessment
- ✓ Safe working procedures
- ✓ Any plans, policies, procedures, monitoring plans about the involved activity.
- ✓ All revised documentation shall be recommunicated with employees.

13.2 Reporting of incidents / accidents

Incidents shall be reported as follows:

Type of incident	Reporting
Near Miss	✓ Principal contractor to follow internal reporting procedure as indicated in the OHS plan.
Near Miss that could have resulted in a section 24 incident.	✓ Principal contractor to follow internal reporting procedure as indicated in the OHS plan. ✓ Report Near Miss to the OHS Agent ✓ Consulting engineers
First Aid case	✓ Principal contractor to follow internal reporting procedure as indicated in the OHS plan.
Medical treatment case	✓ Principal contractor to follow internal reporting procedure as indicated in the OHS plan. ✓ FEM / Compensation commissioner ✓ Report medical to OHS agent. ✓ RE on site
Lost Time Injury	✓ Principal contractor to follow internal reporting procedure as indicated in the OHS plan. ✓ OHS Agent ✓ Consulting engineers ✓ FEM / Compensation commissioner
Section 24 incidents / Fatal incidents	✓ Principal contractor to follow internal reporting procedure as indicated in the OHS plan. ✓ OHS Agent ✓ Consulting engineers ✓ FEM / Compensation commissioner ✓ DOL – within 7 days for section 24 incidents / within 14 days for occupational diseases. Notification must be done via facemail on similar means of communication.
Collapse of sidewall	✓ Principal contractor to follow internal reporting procedure as indicated in the OHS plan. ✓ OHS Agent ✓ Consulting engineers
Employees getting sick due to sewage / Effluent	✓ Principal contractor to follow internal reporting procedure as indicated in the OHS plan. ✓ OHS Agent ✓ Consulting engineers

Any notification to the DOL in terms of a section 24 incident should include:

- ✓ Name of the injured person
- ✓ Address of the injured person
- ✓ Name of the user, employer, or self-employed person
- ✓ Address of the user, employer, or self-employed person
- ✓ Telephone number of the user, employer, or self-employed person
- ✓ Name of contact person
- ✓ Details of the incident: what happened, where it happened when it happened, how it happened, why it happened and the names of witness?

13.3 Record keeping

The following records but not limited to should be kept up to date and available for inspections and audits.

- ✓ Up to date incident register
- ✓ Up to date dressing record
- ✓ WCL 1 & 2 forms
- ✓ Incident investigation forms with supporting documents: supporting documents shall include but not limited to:
 - Method statement
 - Risk assessment
 - Safe working procedures
 - Any plans, policies, procedures, monitoring plans about the involved activity.
- ✓ Incident recall schedule / incident recall
- ✓ Annexure 1, incident investigation forms and all supporting documents shall be kept for at least 3 years.
- ✓ Incident statistics / trends: trends to form part of the OHS committee meeting minutes and displayed on notices boards.
- ✓ Incidents recorded and statistics shall also form part of the monthly report.

14. Control of documents

The principal contractor shall establish a process for the compilation, distribution, control, and disposition of all documents, which are part of the company's Health and Safety Management System. The principal contractor shall also establish a process for the identification, filing, indexing, storage, safeguarding, retention, and disposal of H&S MS records.

- ✓ All non-operational documents must be kept in the file and marked with a stamp as superseded.
- ✓ All operational documents must be kept in the file and marked with a stamp as approved.
- ✓ Documents that have been revised may not be removed from safety files. Revised documents to be maintained in order according to the revision numbers.

15. OHS Budget

- ✓ The principal contractor shall provide the client with a sufficient OHS budget that shall include a complete breakdown of all OHS costs. See under Annexure B a breakdown of the proposed budget that must be completed and submitted.
- ✓ Health and safety expenditure percentage vs progress percentage to be included in the monthly statistical return that must be submitted to the OHS agent on the 25th of each month.
- ✓ All contractors appointed by the principal contractor shall complete sections in the OHS budget applicable to the construction activities to ensure that they have made sufficient provision for the management of OHS.

16. Management of subcontractors

When appointing contractors, the principal contractor shall:

- ✓ Provide any contractor tendering with the sections of the OHS specifications relevant to his / her scope of construction.
- ✓ Ensure that the contractors tendering have made sufficient provision for health and safety costs.
- ✓ Ensure that the contractor appointed have the necessary competencies to perform construction work.
- ✓ Ensure prior appointing any contractor to ensure that the contractor is registered in good standing.
- ✓ Appoint each contractor in writing
- ✓ Ensure that the mandatory agreement is signed between the principal contractor and the contractor.
- ✓ Evaluate the OHS file and OHS plan. Discuss the contents of the OHS plan with the contractor and finally approve or not approve the OHS plan for implementation.
- ✓ Ensure that periodic audits and document verification is conducted at least every 30 days.
- ✓ Stop any contractor from executing construction work which is not in line with the clients OHS specifications and the Principals Contractors OHS plan.
- ✓ Where changes brought about to the design and construction, make available sufficient health and safety information and appropriate resources for contractors to work safely.

Note: No subcontractors can commence with construction activities if the appointed CR 8(1) from the principal contractor is not on site.

17. Access Control

17.1 All employees / contractors and visitors shall receive an access card that is promptly displayed after:

- ✓ Employees was declared medically fit
- ✓ Received principal contractors' site-specific induction.
- ✓ Received Personal protective equipment
- ✓ Training received in applicable procedures, method statements, risk assessments and safe work procedures.

17.2 Once an employee's contract has been terminated or he/she has resigned:

- ✓ Employee shall conduct an exit medical
- ✓ Hand in access card
- ✓ Consolidate all personal information with PPE issue register and exit medical and keep on site as records.

17.3. All visitors shall report to the site office before commencing on site. Visitors will complete the visitors register, screened for covid 19, receive visitor's induction, and be issued with a visitor access card and correct PPE before entering the construction area. All visitators shall be accompanied by the CR 8(1), CR 8(5), or CR 8(7)

18. Public safety

The principal contractor shall ensure that non-employees affected by the construction work area made aware of the dangers likely to arise from the construction work and of the precautionary measures to be observed to avoid or minimize those dangers. The principal contractor shall liaise with the CLO to implement a detailed plan to ensure public safety. This applies to:

- ✓ Non-employees entering the site
- ✓ Surrounding communities
- ✓ Passersby

The contractor shall ensure that fully comply with the requirements as specified in CR 13(2)(i) and CR 27(f) and ensure that:

- ✓ Access to construction areas is completely restricted
- ✓ Information signs, warning signs, prohibition signs and restriction signs promptly displayed

19. Traffic Accommodation

19.1 Traffic Accommodation

The principal contractor shall be responsible for the safe control of traffic on construction sites and public roads. The requirements of the South African Road Traffic Act (Act 93 of 1996) and the National Road Traffic Regulations (2000) as well as the requirements of the relevant authorities shall be always complied with with particular attention to signage and flagmen.

A traffic management plan shall be developed, implemented, and reviewed as the project progresses. The plan shall include but not limited to:

- ✓ Introduction
- ✓ Licensing / Roads / Maintenance
- ✓ Routing of traffic / speed limits and signs
- ✓ Pedestrians and passenger safety
- ✓ Transport of equipment and materials
- ✓ Emergency response and identifying significant hazards.
- ✓ Review of the plan.

The principal contractor shall ensure that:

- ✓ Driveways are properly demarcated
- ✓ Signage to be used – Inspections on signs to be conducted weekly
- ✓ Speed limit should clearly be indicated and displayed.
- ✓ Employees shall be trained in the traffic management plan and traffic management risk assessment.
- ✓ Traffic to adhere to speed reductions and warning signs.
- ✓ Flagmen / Women to be appointed and to receive appropriate training.
- ✓ Flagmen / Women to reduce speed of vehicles. Visibility is essential!

20. Personal Protective Equipment

The principal contractor and all contractors on site shall comply with OHS ACT requirements to provide PPE.

20.1 PPE requirements

The principal contractor shall conduct a PPE survey and based on the risks identified and MSDS requirements provide employees with the correct PPE. The following PPE shall be mandatory on site.

- ✓ Overall, with company logo and reflectors
- ✓ Employees not wearing overalls – reflector vests
- ✓ Safety shoes
- ✓ Hard hat
- ✓ Ear protection
- ✓ Safety goggles
- ✓ Dust Masks

20.2 A PPE issue register shall be completed for all employees. Employees must sign PPE issue registers as proof that PPE was received. PPE shall be issued as follows:

- ✓ Overalls: Three pairs every 6 months
- ✓ Safety boots: One pair every 12 months
- ✓ Reflector vests: One every 6 months
- ✓ Dust Masks: Daily
- ✓ Safety goggles: One pair every 6 months
- ✓ Gloves: One pair every week, depending on conditions

- ✓ Ear protection: Once a month.
- ✓ Hard Hat: Once every year

20.3 Employees to receive training on the correct use, maintenance, and storage of PPE. Attendance registers to be completed as proof that training was received.

20.4 PPE shall be checked monthly and recorded in the appropriate register.

20.5 Procedure to be compiled and implemented to manage redundant PPE.

20.6 Proper storage facilities shall be provided for safekeeping of PPE.

21. Signage

Signage that will be considered and posted are as follows but not limited to:

Entrance

- ✓ Construction sign indication construction is in progress, access is prohibited, and the required PPE needed to access the site. Visitors to report to the site office.

Site office

Name, Surname, picture, and cellphone number of the following shall be displayed:

- ✓ First Aider
- ✓ SHE reps
- ✓ Emergency coordinator
- ✓ Fire fighters
- ✓ Safety officer

At the site office, the following information signs shall also be posted but not limited to:

- ✓ Location of the first aid box and the first aiders
- ✓ Location of fire extinguishers
- ✓ Location of emergency alarms.
- ✓ Toilets
- ✓ Eating areas
- ✓ Drinking water
- ✓ Walkways
- ✓ Assembly points
- ✓ Any other information signs required

Stacking areas

Stacking areas shall be clear, visible, and barricaded with orange netting. No danger tape shall be used. Information signs, warning signs and prohibition signs shall be displayed at all stacking areas.

Construction areas

Based on the site conditions and risks identified the contractor shall ensure that all:

- ✓ Walkways and driveways are clearly visible
- ✓ Emergency evacuation routes and assembly points
- ✓ Required warnings signs
- ✓ Required mandatory signs

- ✓ Required prohibition signs.
- ✓ All signage shall be inspected monthly.

Storing of HCS & flammable liquids

- ✓ Required warnings signs
- ✓ Required information signs
- ✓ Required mandatory signs
- ✓ Required prohibition signs.
- ✓ All signage shall be inspected monthly.

Storing of soil moisture and density gauges and x ray machines

- ✓ Required warnings signs
- ✓ Required information signs
- ✓ Required mandatory signs
- ✓ Required prohibition signs.
- ✓ All signage shall be inspected monthly.

22. Emergencies, evacuation, and response

A formal emergency procedure shall be developed and implemented on site. The plan should address all possible emergencies that can occur and as identified during the risk assessment process.

- ✓ The emergency procedure must be communicated to all employees during induction training.
- ✓ Emergency evacuation plan should be developed and displayed in a prominent area, in all site offices, eating areas, lay down areas and notice boards and must be communicated to all employees during induction training.
- ✓ Trained emergency Co-coordinator to be appointed
- ✓ Trained emergency team to be appointed
- ✓ Trained fire fighters to be appointed
- ✓ Competent first aiders to be appointed; First aiders to have first aid level 2 training.
- ✓ Emergency contact numbers must be displayed in all site offices, eating areas, lay down area and notice boards.
- ✓ Emergency assembly points must be identified and clearly indicated with the appropriate signs.
- ✓ Emergency evacuation routes should be indicated with appropriate signs
- ✓ Emergency alarm should be identified and placed on strategic locations. The alarm must be tested at least once a month. Employees to be informed about the alarm and the use of the alarm.
- ✓ Planned and unplanned emergency drills should take place. After each drill, a meeting must take place, including all the OHS committee members, emergency coordinator and emergency team. Feedback must be given; a formal report must be generated on the estimated response time, evacuation time, problems encountered, and shortcomings identified. Corrective actions should be generated and implemented to improve the overall reaction and management to emergencies. Drills shall take place at least every 3 months.
- ✓ The emergency plan and escape routes must be reviewed regularly and adapted based on changes in the construction work process and site layout

23. Drugs and Alcohol: Intoxication

- ✓ The principal contractor shall develop and implement a drug and alcohol policy.
- ✓ The policy shall be communicated with employees
- ✓ The policy shall be displayed on all offices, notice boards and eating areas.
- ✓ During medicals employees shall be tested for Dagga.
- ✓ Random alcohol tests shall take place daily.
- ✓ Employees found to be under the influence of any alcohol or drugs shall immediately be removed from site.

- ✓ Employees suffering from a medical condition or using medication must declare the medical condition or medicine used to the employer.

24. Equipment Transport to site: Delivery and Offloading

- ✓ Dedicated designated off-loading areas to be established and demarcated. Signs to be displayed to indicate offloading areas.
- ✓ Vehicle roadworthiness tested. Insurance for damage/ loss of loads to be in place. Required PDP and licenses obtained for all delivery vehicles. Competent driver to be assigned. Competencies to be verified.
- ✓ Loads to be always secured.
- ✓ Vehicles to be serviced/ maintained. Copies of maintenance records to be kept on site.
- ✓ No Overloading to be allowed on site.
- ✓ Loads to be always balanced.
- ✓ Traffic Management Plan to be implemented. Speed limit to be obeyed.
- ✓ Equipment to be offloaded by competent, assigned staff.
- ✓ Lifting Equipment use, as per legal requirements.

25. Construction employee facilities

The principal contractor shall ensure that there is:

- ✓ At least one sanitary facility for each sex and for every 30 workers. If mobile toilets are used, they shall be cleaned daily and serviced twice a week. The Contractor shall file these slips as proof.
- ✓ Changing facilities for each sex and
- ✓ Sheltered eating areas.
- ✓ Sufficient cleaning implements (brooms etc.) to be available.
- ✓ Sufficient waste bins to be provided
- ✓ Facilities to be kept clean and inspected daily.
- ✓ Soap and toilet paper to be provide.
- ✓ Waste bins to be kept clean
- ✓ Provision must be made by the principal contractor for sufficient food storage.
- ✓ Food to be consumed only in authorized areas
- ✓ No employees shall be allowed to eat or sleep in confined spaces, excavated areas, on top of temporary works or scaffolding.

26. Stacking and storage areas

- ✓ Plan and designate the laydown area/s.
- ✓ Ensure laydown area is relatively flat and able to take intended loads.
- ✓ Demarcated and barricade the area/s. Display signs to indicated stacking areas.
- ✓ Stack material properly. No stacking allowed outside the planned laydown area. Control delivery and off-loading. Follow manual handling safety rules.
- ✓ Stacking and storing supervisor shall be appointed in writing to supervise stacking and storing on site.
- ✓ Employees shall be trained in the correct stacking and storage practices.
- ✓ The height of any stack shall not exceed three times the width of the base of the stack.
- ✓ Walkways of at least 1.5 meters to be left open between stacks.
- ✓ Superfluous material shall be removed from walkways.
- ✓ All stacking areas shall be barricaded with orange netting.
- ✓ Signs shall be displayed to indicate stacking areas.
- ✓ Stacking areas shall be inspected to ensure that it is safe and effective.
- ✓ Employees shall not be allowed to move any tools / equipment / steel / pipes that exceed 25 kilograms by themselves.
- ✓ Pipes shall be stacked on a firm base.
- ✓ Build stacks only on dry, level, and firm ground
- ✓ No stock should obstruct exit routes or doors, ventilation, etc.
- ✓ Stacks should be broken down from the top only

- ✓ All break downs due to instability should be supervised
- ✓ If there is any danger of instability, stack should be broken down immediately under competent supervision

27. Housekeeping

- ✓ The contractor shall develop a detailed waste management plan and communicate it to all involved. Include the EIA recommendations in the plan.
- ✓ Stacking and storage regulations to be implemented & monitored.
- ✓ Rubble removal to be done regularly, removal to a registered dump site.
- ✓ Chemical / facilities / store areas to be separated and in one area (as far as reasonably practicable). Inspect works area before works commence, DSTI'S and PTO to be completed.
- ✓ Color coded waste bins shall be used on site for the disposal of waste. Waste shall be classified according to their nature (*cans, plastic, offcuts, hazardous waste etc.*). Bins shall be color coded or marked and waste shall be separated and disposed as indicated in the waste management plan. If the contractor uses a service provider to pick up and dispose waste, slips of waste removal shall be kept as records.
- ✓ Provide enough waste bins and label them
- ✓ Place bins in demarcated areas
- ✓ Mark out aisles, walkways, roadways, and passages
- ✓ Mark out works areas, goods loading or storage areas
- ✓ Control stock level
- ✓ Have sufficient storage space for tools and materials
- ✓ Use color coding to warn people about any danger
- ✓ Display signs and educate people as to what they mean
- ✓ Provide training and explain responsibility for complying with standards
- ✓ Allocate space for storage of items like brooms and mops
- ✓ Appoint responsible person for checking on standards and following up deviations
- ✓ The contractor shall appoint a team responsible for housekeeping. The team shall be supervised by the stacking and storing supervisor.

28. Construction vehicles and mobile plant

The Contractor shall:

- ✓ Appoint a construction /mobile plant supervisor to supervise construction vehicles and mobile plant.
- ✓ Develop and implement a traffic management plan to ensure that construction vehicles / mobile plant is properly organized and controlled.
- ✓ Equip construction vehicles with acoustic warning devices.
- ✓ Equipped construction vehicles with an automatic acoustic reversing alarm.
- ✓ Maintenance records to be obtained. Maintenance schedule to developed and implemented.
- ✓ Appoint all operators. Operators shall be specifically trained to operate construction vehicles / mobile plant. Operators shall be in possession of a certificate of training issued by an accredited training provider.
- ✓ Conduct medical certificates of fitness in the form of an annexure 3.
- ✓ Inspect all vehicles and mobile plant before use.
- ✓ Inspection registers to be signed by the operator and driven machinery supervisor.
- ✓ Flagman/women to control traffic on site.
- ✓ Plant operators to use the required PPE.
- ✓ Use drip trays to prevent pollution.
- ✓ Practice dust allaying where relevant.
- ✓ Demarcate roadways and separate walkways.
- ✓ Control vehicle speed.

29. Use of hand tools

- ✓ Generate as specific RA and SWP to be compiled for hand tools and communicated with employees.
- ✓ Checklist and/or registers to be completed regularly by competent staff.
- ✓ Required PPE to be used.

- ✓ Planned task observations to be conducted on all employees using hand tools.

30. Use and operate portable electrical equipment.

- ✓ Generate specific method Statement, RA and SWP for portable electrical tools.
- ✓ Method statement, RA and SWP to be communicated to all involved.
- ✓ Conduct PTO's on all employees using portable electrical equipment.
- ✓ Where reasonably practicable use only equipment with sound levels below 85Db (A).
- ✓ Employees to be trained in the use of portable electrical tools
- ✓ No employees shall work with portable electrical tools in wet conditions.
- ✓ All electrical tools shall be fitted with a "dead man" switch.
- ✓ Electrical tools not in use shall be unplugged.
- ✓ All cables and extensions shall be routed safely in such a way that it does not pose as a tripping hazard.
- ✓ Cables and extensions are not allowed to be coiled when in use.
- ✓ Defective portable electrical tools shall be quarantined until such a time that it has been fixed by a qualified person.

30.1 Circular Saws

- ✓ A proper method statements, risk assessment and SWP to be developed and communicated with employees. Planned task observations to be conducted on employees.
- ✓ No user shall require or permit any person to operate a power-driven circular saw-
- ✓ At a speed more than the manufacturer's rated maximum speed for the saw blade, or the saw blade of which is in any way damaged, or which is dull or not regular or not correctly sharpened and set.
- ✓ The user of a power-driven bench saw shall cause - the saw blade to be effectively guarded below the table; and the part of the saw blade above the table to be covered by a substantial guard which shall cover the saw at all times to at least the depth of the teeth and which shall automatically adjust itself to the thickness of and remain in contact with the material being cut: Provided that where such a guard is impracticable, the top of the saw shall be covered by a strong manually adjustable guard which shall be adjusted to extend downwards to a point as near as practicable to the cutting point of the saw: Provided further that in the case of a breakdown saw, the guard shall effectively cover the top of the saw blade.
- ✓ The user shall cause every power-driven circular saw which is used for ripping wood to be provided with a riving knife which shall - be placed as close as practicable to the saw blade but not more than 12 mm behind it, and in a direct line with the saw teeth at the level of the bench table; have the edge nearest the saw in the form of an arc of a circle which shall have a radius not exceeding the radius of the largest saw blade which can be used on the bench by more than 3 mm;
- ✓ Extend to a height above the table to within 5 mm of the top of the saw blade; and have a smooth surface and which shall be strong, rigid, and easily adjustable.
- ✓ The user shall cause every tilting saw or tilting table saw to be so arranged that the adjustment of the riving knife and the guard remains effective with any position of the saw or table.
- ✓ The user shall - cause a suitable push stick to be kept available at every bench saw which is fed by hand, to enable work to be carried out without danger to persons; provide suitable mechanical means for holding rough timber which is to be slabbed on a bench saw; and provide an effective guard for the automatic feed rollers of every bench saw equipped with such rollers.
- ✓ The user shall cause every swing or radial saw which is moved towards the material - to be guarded so that only the cutting portion of the saw blade is exposed; to be arranged in such a manner that the saw will automatically move away from the cutting position when it is released; and to be fitted with a device which will oppose the thrust or tendency of the saw to pick up the timber or to throw the timber back at the operator when such saw is used for ripping timber.
- ✓ The user of a portable power-driven circular saw shall provide - a fixed guard above the slide or shoe, which shall cover the saw blade to at least the depth of the teeth; and a guard which shall automatically cover the portion of the saw blade below the slide or shoe while sawing is not actually being done.

30.2 Grinders

- ✓ A proper method statements, risk assessment and SWP to be developed and communicated with employees. Planned task observations to be conducted on employees.

- ✓ Employees to be appointed in writing to use grinders for cutting and grinding
- ✓ Employees to be trained in the use of grinders
- ✓ All grinders to be placed on an inspection register and inspected before use.
- ✓ Pre-work inspections must be conducted to identify flammables in the area. Flammables must be removed.
- ✓ Hot work permit to be obtained for cutting activities.
- ✓ Fire extinguishers shall be present where grinding / cutting activities are taking place.
- ✓ Screens and fire blankets to be present where cutting and grinding activities takes place.
- ✓ Cutting discs to be inspected before use.
- ✓ All redundant cutting / grinding discs to be disposed in the correct bin (refer to waste management plan)
- ✓ Employees must unplug grinders when not in use or when the discs are changed.
- ✓ Employees to cut into a straight line to ensure that material does not grab the disc.
- ✓ No employees shall work with grinders in wet conditions.
- ✓ All cables and extensions shall be routed safely in such a way that it does not pose as a tripping hazard. Cables and extensions are not allowed to be coiled when in use.
- ✓ Employees using grinders to wear overall, face shield, earplugs, safety goggles, safety shoes, leather apron, leather gloves and leather spats. No nylon clothing or jewelry to be used.

31. Temporary Electrical Installations

- ✓ A competent temporary electrical installation controller shall be appointed in writing.
- ✓ The appointed temporary electrical installation controller shall be a registered electrician with a wiremen's license.
- ✓ Lock-out procedure, Method statement, RA and SWP compiled and communicated with all involved.
- ✓ Lock-out procedure complied with when installing temporary DB.
- ✓ When fully installed make DB live taking precautionary measures so as not to electrocute anybody.
- ✓ Certificates of Compliance completed for DB.
- ✓ Weekly inspections.
- ✓ Install flash plates. Installation checked by Competent Person.
- ✓ All switches, plugs, jointing, fuse boxes and distribution boards must be in sound condition and safe.

32. Compressed Air Tools

- ✓ Pressure tests as per legal requirement.
- ✓ Place pressure test results and certificates on safety file
- ✓ No compressed air to be directed to person.
- ✓ Equipment registers to be maintained.
- ✓ Equipment / hose links secured with safety slings.
- ✓ Minimize dust liberation when using compressed air.
- ✓ Use required PPE when working with compressed air.

33. Ladders (fixed and portable)

- ✓ Appoint a ladder inspector.
- ✓ Number all ladders (fixed and portable).
- ✓ Generate ladder registers.
- ✓ Train employees in the correct usage of ladders
- ✓ Inspect ladders before use.
- ✓ A proper method statements, risk assessment and SWP to be developed and communicated with employees. Planned task observations to be conducted on employees.
- ✓ An employee shall ensure that every ladder is constructed of sound material and is suitable for the purpose for which it is used, and -is fitted with non-skid devices at the bottom ends and hooks or similar devices at the upper ends of the stiles which shall ensure the stability of the ladder during normal use; or is so lashed, held or secured whilst being used as to ensure the stability of the ladder under all conditions and at all times.
- ✓ No employer shall use a ladder, or permit it to be used, if it - has rungs fastened to the stiles only by means of nails, screws, spikes or in like manner; or has rungs which have not been properly let into the stiles: Provided that in the case of welded ladder or ladders of which the rungs are bolted or riveted to the stiles, the rungs need not be let into the sides; or has damaged stiles, or damaged or missing rungs.

- ✓ No employer may permit that - a ladder which is required to be leaned against an object for support be used which is longer than 9 m; and except with the approval of an inspector, the reach of a ladder be extended by fastening together two or more ladders: Provided that the provisions of this sub regulation shall not apply to extension of free-standing ladders.
- ✓ When work is done from a ladder, the employer shall - take special precautionary measures to prevent articles from falling off; and provide suitable sheaths or receptacles in which hand tools shall be kept when not being used.
- ✓ An employer shall ensure that a fixed ladder which exceeds 5 m in length and is attached to a vertical structure with an inclination to the horizontal level of 75 or more - has its rungs at least 150 mm away from the structure to which the ladder is attached; and is provided with a cage which - extends from a point not exceeding 2.5 m from the lower level to a height of at least 900 mm above the top level served by the ladder; and 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:
- ✓ Provided that the foregoing provisions shall not apply if platforms, which are spaced not more than 8 m apart and suitable for persons to rest on, are provided.

34. Scaffolding

- ✓ All scaffolding shall be constructed according to SANS 10085
- ✓ Competent scaffold supervisor to be appointed.
- ✓ Competent erectors and inspectors to be appointed.
- ✓ Scaffolding to be built according to designs.
- ✓ Scaffolding checklists to be developed.
- ✓ Scaffolding work to be supervised by a competent scaffold supervisor.
- ✓ Scaffolding to be inspected and declared safe before use.
- ✓ Green tag or red tag to be displayed.
- ✓ Scaffolding to be regularly inspected.

35. Clearing, grubbing and vegetation clearance

- ✓ Develop a method statement, risk assessment and safe working procedure and communicate with employees.
- ✓ Traffic Management Plan to be developed to ensure that construction vehicles / mobile plant is properly organized and controlled.
- ✓ Appoint a driven machinery supervisor to supervise driven machinery.
- ✓ Appoint all operators.
- ✓ Operators must be specifically trained to operate construction vehicles / mobile plant.
- ✓ Appoint and train employees to handle dangerous snakes.
- ✓ Obtain equipment to handle dangerous snakes.
- ✓ Get in contact with hospitals and emergency services that can assist with possible snake bites.
- ✓ Develop a detailed emergency response plan for snake bites and communicate with employees.

36. Excavations

- ✓ Develop a method statement, risk assessment, safe working procedure and emergency evacuation plan in case of a collapse and communicate with employees.
- ✓ Geotechnical report to be taken in consideration before starting with excavations.
- ✓ All excavations to be inspected and declared safe by a competent person.
- ✓ Permit to be obtained before working in excavations.
- ✓ Competent excavation supervisor to be appointed in writing.
- ✓ Excavation inspection register to be completed by a competent person.
- ✓ Liaise with Geotechnical professional to develop an inspection schedule to regularly inspect excavations and ground conditions.
- ✓ DSTI to be completed and communicated with employees.
- ✓ Ladders used for access to be used not exceeding 6 meters from area where employees are working.
- ✓ Regular inspections to be conducted by the geotechnical professionals on stability of ground conditions.
- ✓ No plant, equipment, or material to move or to be stored/stacked on the edges of any excavation.

37. Bedding and backfilling

- ✓ Method statement, risk assessment and SWP to developed and communicated with employees.
- ✓ Depending on if excavations is battered or shored the contractor must indicate a safe working distance to prevent any load, material, plant, or equipment is moved or placed on the edges of the excavation.
- ✓ No material to be stored on the edges of excavations.
- ✓ Driven machinery used to put material in excavated areas to comply with safe distances from the edges of excavations to prevent possible collapse of sidewalls.
- ✓ Employees to use the correct PPE.
- ✓ Regular checklists to be completed for compactors and hand tools.

38. Lifting machines and Lifting equipment

38.1 Lifting machines

- ✓ All lifting machines to be constructed in accordance with acceptable technical standards.
- ✓ Ensure safe work loads are conspicuously displayed, identification plates are displayed.
- ✓ Ensure that it has at least three full turns of rope on the drum.
- ✓ Obtain load test certificates not exceeding 12 months and ensure that it is up to date and still valid.
- ✓ Full-service history records to be obtained.
- ✓ Crane operators and riggers to be appointed in writing.
- ✓ Competency certificates and medical certificates of fitness to be verified.
- ✓ Operators must be specifically trained to operate a particular lifting machine.
- ✓ Operators must be in possession of a certificate of training issued by a training provider accredited at the Transport Seta.
- ✓ Generate inspection registers for all lifting machines. All lifting machines to be inspected before use. Inspection checklist to be completed and signed by the operator and supervisor.
- ✓ Deviations or defects to be reported immediately and rectified. If not possible lifting machines to be removed from site until fully compliant.
- ✓ *An excavator is not classified as a lifting machine. Excavators shall not be used as a lifting machine.*

38.2 Lifting equipment

- ✓ All chains and ropes that form part of the load path of the lifting machine to have a factor of safety provided to the standard to which the machine was manufactured.
- ✓ Hooks or any other load attaching devices shall be designed or proportioned that accidental disconnection cannot take place.
- ✓ Verify that ropes, chains, hooks, other attaching devices, sheaves, brakes, and safety devices went through a thorough examination by a competent person not exceeding six months.
- ✓ Generate registers for all lifting equipment.
- ✓ Place all lifting equipment on registers with serial numbers and test certificates.
- ✓ All lifting equipment to be inspected before use.
- ✓ Inspection checklist to be completed and signed by the operator and supervisor.
- ✓ Damaged lifting equipment to be removed from site immediately.

39. Lifting operations

- ✓ Method statement, risk assessment and SWP to be developed and communicated with employees.
- ✓ Crane operators and Competent riggers to be appointed in writing.
- ✓ Crane radius and slew path correctly designed and restricted where required.
- ✓ Depending on if excavations is battered or shored the contractor must indicate a safe working distance to prevent any load, material, plant, or equipment is moved or placed on the edges of the excavation. Generating inspection registers for lifting machines and equipment.
- ✓ DSTI to be conducted and communicated with employees.
- ✓ All lifting activities to be controlled by competent riggers.
- ✓ Areas where lifting activities are taking place to be barricaded. Access to be restricted.
- ✓ No employees to work/walk under suspended loads.

- ✓ Crane operator and rigger to use two-way radio for communication. Two assistants used on both sides of the 12-meter pipes with guide ropes to prevent swinging of pipes.

40. Welding and flame cutting activities

- ✓ Appoint supervisor to supervise welding and flame cutting operations.
- ✓ Develop a specific method statement, RA and SWP for welder and flame cutting equipment.
- ✓ Train operators in the safe operation of welders and flame cutting equipment.
- ✓ Issue employees with the correct PPE.
- ✓ Provide proper ventilation for welding, flame cutting operations.
- ✓ Checklist and/or registers to be completed regularly by competent staff.
- ✓ All welding machines and flame cutting machines to be maintained and/or repaired.
- ✓ Required PPE to be used.
- ✓ Gas cylinders to be maintained and stored as indicated in the pressure equipment regulations.

41. Cathodic protection

- ✓ Method statement, RA and SWP to be developed and communicated with employees.
- ✓ DSTI to be conducted before installing cathodic protection.
- ✓ Inspection checklist to be completed.
- ✓ Correct PPE to be used.

42. Steel fixing

- ✓ Develop method statement, risk assessment and SWP for steel fixing.
- ✓ Tie reinforcing steel according to drawings.
- ✓ Use correct PPE when tying steel.
- ✓ Clean steel tying area at least daily and place off-cuts in provided skip.

43. Working in a fall risk position

- ✓ A competent fall protection plan developer to be appointed in writing.
- ✓ A fall protection plans to be developed implemented and revised as the project progresses.
- ✓ A risk assessment shall be devolved for all work where there is a risk of falling.
- ✓ The issue-based risk assessment and the fall protection plan shall be communicated with all employees.
- ✓ All employees shall be declared medically fit before working on heights.
- ✓ A training program shall be developed and implemented for employees working in a fall risk position. Training should be SAQA accredited.
- ✓ A suitable rescue plan with the necessary rescue equipment shall be available on site and employees shall be trained in the rescue plan.
- ✓ The principal contractor shall clearly specify how testing, inspecting and maintenance of fall protection equipment will take place.
- ✓ Checklist and/or registers to be compiled.
- ✓ Registers to be completed at regular intervals.
- ✓ Fall prevention devices like barricades, fences and covers should be considered before implementing fall arrest equipment
- ✓ All anchor points shall be secured. Anchor points shall be independent, prevent a person to fall more than 1.8 meters.
- ✓ Fall arrest equipment shall be certified and placed on register. Daily inspections to be done before use.
- ✓ When working on heights employees must make use of a buddy system.
- ✓ When employees work on heights, they must be 100% tied down. At least one lanyard must be always secured.
- ✓ All tools to be fitted with lanyards and to be worn around wrists.
- ✓ Chin straps to be used on hard hats.
- ✓ Bolt bags to be used when bolts are taken up and down.
- ✓ Drop zones to be clearly identified where overhead work is taking place. Yellow danger tape should be used as barricading. Signs to be posted to ensure no employees walk or work under overhead work.

- ✓ Objects are not to be thrown from elevated positions
- ✓ No working at heights shall take place during inclement weather.

44. Tie into existing services

- ✓ Liaise VREDE / THEMBELIHLE WWTW control room on tie-in positions.
- ✓ Ensure persons to do tie-in connections are competent.
- ✓ Co-ordinate with VREDE / THEMBELIHLE WWTW control room for lockout where applicable.
- ✓ Obtain permit to work.
- ✓ Clarify the duration of the shutdown (12-hour, 24 hours)
- ✓ Develop detailed method statement, RA and SWP for Tie into existing services.
- ✓ Develop and communicate lock out procedure.
- ✓ Competent person/s to supervise tie-in.
- ✓ Do tests to ensure tie-in is correctly completed.
- ✓ Remove lockout.

45. Confined spaces

- ✓ Co-ordinate with KOFFIFONTEIN WWTW control room for lockout where applicable.
- ✓ Obtain permit to work.
- ✓ Specific method statement, risk assessment and SOP to be generated and communicated with employees.
- ✓ A competent person to be appointed to test the air in a confined space.
- ✓ All employees working in confined spaces to be trained in confined spaces
- ✓ A permit to work must be obtained before commencing with any work inside a confined space
- ✓ A detailed emergency evacuation plan to be developed in case of an emergency inside a confined space.
- ✓ The Contractor to comply with all the requirements as specified in the GSR 5

46. Adverse weather conditions

The Contractor shall implement an early warning system to identify inclement weather and to prevent such weather from posing negative implications on the safety of employees and other persons visiting.

The early warning system shall as a minimum provide for the following:

46.1 Construction work done during electrical storms

- ✓ The contractors shall ensure that all employees are removed from heights and all employees are as safe as possible, in inclement weather conditions.
- ✓ No work is allowed on the construction site during electric storms where employees cannot be protected from it.
- ✓ Protection involves employees being restricted to:
 - eating area fitted with a lightning mast
 - workshops
 - inside buildings
- ✓ No work is allowed in electrical storms on top of open structural steel, even when earthed.
- ✓ No work is allowed on heights when the lightning is within a 10-kilometre radius.
- ✓ After inclement weather on-site risk assessments will be reviewed to include wet conditions.

46.2 Lifting equipment operations during inclement weather

- ✓ Lifting operations will stop during lightning within a 10-kilometre radius and wind above 28 km/h, and the lifting equipment operator will not be allowed to leave the lifting equipment with the booms extended.
- ✓ Lifting operations will stop during rain, rigging and hand lifts.
- ✓ Booms on all lifting equipment will be retracted.
- ✓ All rigging operations will stop, and employees will be removed from site.

46.3 Construction work done during rain

- ✓ During rainy conditions all work on steel structures will stop.
- ✓ No electrical tools will be used during rainy weather in open areas.
- ✓ Work can be done in waterproof areas where there is a zero risk for electrocution.
- ✓ Areas that may be cleared for work during rain includes:
 - workshops
 - offices
 - work on ground level with the provision that the area is maintained in a safe dry condition

46.4 Driving in inclement weather

THE CONTRACTOR shall ensure that the danger of driving in wet conditions is adequately covered in a risk assessment.

The risk assessment shall include, but not limited to:

- ✓ route planning
- ✓ speed reduction
- ✓ planning for emergency situations
- ✓ driving precautions for slippery surfaces
- ✓ visibility hazards

47. Use and storage of flammable liquids

- ✓ Where flammable liquids are being used, applied, or stored at the workplace concerned, it is done in a manner that does not cause a fire or explosion hazard, and that the workplace is effectively ventilated.
- ✓ No person smokes in any place in which flammable liquid is used or stored, and the contractor must affix a suitable and conspicuous notice at all entrances to any such areas prohibiting such smoking.
- ✓ An adequate amount of efficient fire-fighting equipment is installed in suitable locations around the flammable liquids store with the recognized symbolic signs.
- ✓ Only the quantity of flammable liquid needed for work on one day is taken out of the store for use.
- ✓ All containers holding flammable liquids are kept tightly closed when not in actual use and, after their contents have been used up, are removed from the construction site, and safely disposed of.
- ✓ where flammable liquids are decanted, the metal containers are bonded and
- ✓ earthed; and no flammable material, including cotton waste, paper, cleaning rags or similar material is stored together with flammable liquids.

48. Hazardous chemical substances:

48.1 Chlorine building

- ✓ Ensure that chlorine building is cool, dry, and well ventilated.
- ✓ Ensure that sufficient space is provided to secure cylinders.
- ✓ Ensure that aluminum, brass, copper, manganese, tin, and steel is not stored with chlorine.
- ✓ Ensure that it is not stored with nitrogen compounds. Install a system of local or exhaust installation. Use an enclosed and isolated system if possible.
- ✓ Issue employees with the correct PPE.
- ✓ Training employees in the correct handling and storage of chlorine. Communicate MSDS with employees.
- ✓ Building constructed to comply with all legal and other requirements for the safe storage of chlorine.
- ✓ All warning signs, information signs, prohibition signs and mandatory signs to be displayed
- ✓ MSDS to be available in area
- ✓ Do final inspections and sign completion certificates.
- ✓ Obtain O&M manuals. Obtain warranties.

- ✓ All signage to be displayed as specified in the MSDS.
- ✓ Ensure suitable extinguishing media is available like water spray, foam. Do not use carbon dioxide halogenated extinguishing materials.
- ✓ Periodic inspections to be conducted by a competent person to ensure that equipment is used appropriately and that the systems is kept in suitable operating conditions.
- ✓ Regularly inspect and tests piping, and containment used of chlorine services.
- ✓ Valves and hoses to be in the correct position before transfer and starting operations
- ✓ Chlorine containers to be properly handled.
- ✓ Store in well ventilated areas. Do not drag, roll, or slide cylinders.
- ✓ Protect cylinders from physical damages.
- ✓ Keep containers tightly closed.
- ✓ Employees to use the correct PPE.
- ✓ Chlorine emergency equipment to be close to where chlorine is handled.

48.2 General Chemicals used during construction

- ✓ An inventory of all raw material and all intermediate mixtures shall be available and kept up to date.
- ✓ System to be in place to ensure that only authorize substances are brought on to the premises.
- ✓ Competent person to be appointed in writing to coordinate and control all HCS.
- ✓ All HCS to be stored in a proper HCS store. Store must be well ventilated. Signage to be displayed and fire extinguishers to be available at the storage area.
- ✓ Material safety data sheet shall be available for chemicals
- ✓ Employees using chemicals shall be trained in the material safety data sheets
- ✓ Copies of the material safety data sheets shall be kept in the office and in the HCS store.
- ✓ Employees to wear PPE as required by the MSDS.

49. Exposure to dangerous and poisonous animals

The Contractor shall therefore where applicable ensure that the following are duly adhered to:

- ✓ If any bees or snakes are observed the VREDE / THEMBELIHLE WWTW safety officer and specialist should be informed immediately.
- ✓ the emergency procedure be expanded to provide for the effective treatment of employees or other persons visiting exposed to bites or stings from poisonous animals and insects, i.e., the contact details of the nearest medical unit that could treat employees exposed to bites or stings be obtained and arrangements be made with this service provider on the procedures to be followed to ensure swift response when required.
- ✓ confirmation be obtained from this medical unit that they have anti venom reserved to treat employees or other persons visiting that may be exposed to snake bites or scorpion stings.
- ✓ competent first aiders be available to facilitate the treatment of employees or other persons visiting exposed to stings or bites; and
- ✓ the potential exposure posed by poisonous animals or insects and awareness thereof is discussed with all employees as part of the toolbox talks and general awareness training and other persons visiting as part of the pre-site visit induction process.

50. Working close to water

- ✓ The contractor must ensure that where work is performed close to or over water, provision is made for preventing persons from falling into the water and rescuing any person who may fall into the water. Any person in danger of drowning must be provided with a life jacket, by the contractor.

51. Noise

- ✓ The employer shall reduce the equivalent noise level to below 85 dB(A) or, where this is not reasonably practicable, he shall reduce the level to as low as is reasonably practicable and take all reasonable steps to isolate the source of the noise acoustically.

- ✓ Where the equivalent noise level in any workplace cannot be reduced to below 85 dB(A), demarcate the boundaries of all noise zones in such workplace by posting up notices to that effect in conspicuous places along such boundaries and at all entrances to and exits from any room where the whole of such room constitutes a noise zone; and (prohibit any person from entering a noise zone unless such person wears hearing protectors.
- ✓ In the case of building work where it is not reasonably practicable to comply with the provisions of sub regulation (4)(a) owing to the nature or extent of the premises, the employer shall post up such notices at all exits from and entrances to such premises or where this is not reasonably practicable, display such notices in a conspicuous place as close as possible to the actual workplace or in such place as an inspector may direct.
- ✓ The employer shall provide, free of charge, hearing protectors to each employee who works in or, to any person who is required or permitted to enter a noise zone, and no employer shall require or permit any person to work in or enter such noise zone, and no person shall work in or enter such noise zone, unless he wears such hearing protectors in the correct manner: Provided that where the equivalent noise level to which employees are exposed, is such that the attenuation of the hearing protectors does not reduce the said noise to below 85 dB(A) the employer concerned shall limit the time during which employees work in that noise zone in such a way that they are not exposed to an equivalent noise level equal to 85 dB(A) or higher.

52. Ventilation

- ✓ An employer shall ensure that every workplace in his undertaking is ventilated either by natural or mechanical means in such a way that -
- ✓ the air breathed by employees does not endanger their safety.
- ✓ the time-weighted average concentration of carbon dioxide therein, taken over an eight-hour period, does not exceed one half per cent by volume of air.
- ✓ the carbon dioxide content thereof does not at any time exceed three per cent by volume of air.
- ✓ the prescribed exposure limits for airborne substances therein are not exceeded; and
- ✓ the concentration therein of any explosive or flammable gas, vapor or dust does not exceed the lower explosive limit of that gas, vapor, or dust.
- ✓ The contractor shall ensure that dust is controlled, and that dust suppression takes place daily. Water truck to be used to keep site free from dust.

53. Illuminance

Every employer shall cause every workplace in his undertaking to be lighted in accordance with the illuminance values specified in the Schedule to the Environmental Regulations for the workplace: Provided that where specialized lighting is necessary for the performance of any particular type of work, irrespective of whether that type of work is listed in the Schedule or not, the employer of those employees who perform such work shall ensure that such specialized lighting is available to and is used by such employees.

The employers shall ensure that -

- ✓ the average illuminance at any floor level in a workplace within five meters of a task is not less than one fifth of the average illuminance on that task.
- ✓ glare in any workplace is reduced to a level that does not impair vision.
- ✓ lighting on rotating machinery in such that the hazard of stroboscopic effects is eliminated; and
- ✓ luminaires and lamps are kept clean and, when defective, are replaced or repaired forthwith.

54. Electrical and mechanical works

- ✓ Co-ordinate with KOFFIFONTEIN WWTW control room for lockout where applicable.
- ✓ Obtain permit to work.
- ✓ Clarify the duration of the shutdown (12-hour, 24 hours)
- ✓ Develop detailed method statement, RA and SWP for electrical and mechanical works.
- ✓ Develop and communicate lock out procedure.
- ✓ Liaise with the VREDE / THEMBELIHLE WWTW control room to ensure that lockout where applicable is done.

- ✓ Ensure, where applicable lockout is functional.
- ✓ Competent person/s to supervise electrical and mechanical works
- ✓ Do final inspections and sign completion certificates.
- ✓ Obtain O&M manuals.
- ✓ Obtain warranties.

55. Covid 19, Corona Virus: Safely return to work

On the 26th of June 2022 regulations 16A,16B,16C of the regulations relating to surveillance and control of notifiable medical conditions made in terms of section 90(1)(j), k and W of the National Health Act,2003 (Act 61 from 2003 and promulgated on 4 May 2022 under government notice 2060 was repealed in its entirety. Despite the repeal the principal contractor and all contractors shall fully comply with the government code of practice: Managing SARS-cov-2 in the workplace set out in the schedule issued by the National economic development and Labour Council in terms of section 203(1) of the Labor Relations Act that came into effect on the 22nd of June 2022

56. Working close to sewage & effluent

- ✓ All employees to get Hepatitis B injections.
- ✓ Conduct a risk assessment for employees working in or with leaking effluent/sewage.
- ✓ Train employees in terms of the requirements as specified in the regulations for hazardous biological agent's section 4.
- ✓ Implement a suitable procedure that is standardized to monitor the exposure to leaking effluent /sewage.
- ✓ Issue employees with the correct PPE.

57. Removing of asbestos material

The contractors responsible for the removing of asbestos material shall fully comply with the requirements of the Asbestos regulations.

ANNEXURE A

Project name:	
Area:	
Construction Manager:	
Safety officer:	
Scope of Work:	
Start Date:	
Estimated date of Completion:	
Actual construction progress:	
Time lapsed:	
Health and safety expenditure percentage vs Progress percentage.	
Last Audit Result	

MAN-HOURS WORKED

Month End Date	Employees Hours Worked	Visitor's Hours	Sub-Contractor Hours Worked	Total Hours

INJURY STATISTICS

	Main Contractor	Sub-Contractor	Comments
Fatal Accidents			
Lost Time Injuries			
Medicals			
First aid cases			
Motor vehicle accidents			
Damages			

	Main Contractor	Sub-Contractor	Comments
Assault			
Near Misses			
LTIFR = (LTI x 200 000) / Man Hours			

Details of the Incidents (Name of contractor / sub-contractor):		
Outcome (Fatality, LTI, etc.)	Date	Description

HIRA's / TRAINING & INDUCTIONS

	Total Number Completed for Month	Total Number Completed to Date	Total Number Pending	Total Due for Review or Retraining	Comments
HIRA					
Training / Induction					

Prepared	Approved
Site Safety Officer	Construction manager

ANNEXURE B

REFURBISHMENT OF THE WASTEWATER TREATMENT WORKS IN VREDE / THEMBELIHLE

Number	Description	Unit	quantity	Rate	Total
Occupational Health and Safety Management:					
	Registered Construction Health and safety officer	Month			
	Laptop	Sum			
	Printer	Sum			
	Office	Month			
	Laminator	Sum			
	SMI Board	Sum			
	Laminating pouches	Month			
	Printing Paper	Month			
	Printing Cath ridges	Month			
	Dividers	Month			
	Files	Month			
	Stationary	Sum			
Competencies, Training and Communication:					
	Safety for Supervisors training	Sum			
	Legal Liability training	Sum			
	Hazard identification and risk Assessment training	Sum			
	Incident investigation training: Level 3	Sum			
	First aid training. Level 1 and 2	Sum			
	Firefighting training	Sum			
	Emergency co-ordinator training	Sum			
	Safety Representative training	Sum			
	Basic working at heights training	Sum			
	Scaffold erector training	Sum			
	Scaffold inspector training	Sum			
	Scaffold supervisor training	Sum			
	Excavation supervisor training	Sum			
	Fall protection plan developer training	Sum			
	Confined space training	Sum			
	Use of electrical tools and portable electrical equipment.	Sum			
	Snake handling training	Sum			
	Crane operator	Sum			
	Rigging training	Sum			
	Stacking and storage training				
	Other	Sum			
Medical surveillance:					
	Pre employment	Sum			
	Annual Medical	Sum			
	Exit Medical	Sum			

	Medical surveillance	Sum			
Incident Management:					
	First Aid Box	Sum			
	Refill kits	Month			
	Spine Board	Sum			
	Immobilisation Package	Sum			
Access control:					
	Access cards for employees, visitors	Month			
	Office cubicle for security	Sum			
	Office furniture	Sum			
	Locker	Sum			
	Stationary	Sum			
	Visitor register	Month			
	Alcoholise	Sum			
	Training to use alcoholise	Sum			
Traffic Accommodation:					
	Flag person training	Sum			
	Flags	Sum			
	Traffic signage	Sum			
	Traffic Management Plan	Month			
	Traffic accommodation	Month			
PPE:					
		Sum			
	Overall, with company logo and reflectors				
		Sum			
	Employees not wearing overalls – reflector vests				
	Safety shoes	Sum			
	Hard hat	Sum			
	Ear protection	Month			
	Safety goggles	Month			
	Dust Masks	Month			
	Gloves	Month			
	Other	Monthly			
Signage:					
	Warning signs				
	Information signs				
	prohibition signs				
	Mandatory signs				
Emergencies:					
	Emergency evacuation alarms	Sum			
	Emergency signs	Sum			
	Fire Extinguishers	Sum			
	Emergency Equipment's	Sum			
Control of Documents: Client OHS specifications section 14					
	Approved stamp	Sum			
	Superseded stamp	Sum			
Stacking, Storing & Housekeeping:					

	Orange safety netting	Month			
	Warning signs	Sum			
	Information signs	Sum			
	prohibition signs	Sum			
	Mandatory signs	Sum			
	Colour Coded dust bins	Sum			
	Other				
Temporary Electrical Installations:					
	Temporary electrical installation controller.	Sum			
	Monthly earth leakage tests	Month			
	COC	Sum			
	Other				
Excavations:					
	Safe access				
	Orange safety netting				
	Signage				
	Battering of excavations				
	Ladders				
	Material to shore and brace excavations				
Temporary Works:					
	Temporary works designer				
	Temporary works designs				
	Inspections before pouring concrete				
	Inspections during pouring concrete				
	Inspections after pouring concrete				
Working in a fall risk position:					
	Fall protection plan developer	Sum			
	Tools to be fitted to wrist bands	Month			
	Hard hats with chin straps	Sum			
	Bolt bags – to be used to take up bolts, nuts, and tools	Sum			
	Safety Harnesses	Sum			
	Lifelines – if no appropriate anchor points are available	Sum			
	Anchor points	Month			
	Rescue equipment	Sum			
	Other				
Cranes and lifting:					
	Load test / hook test	Sum			
	Rigging ropes/slings inspections	Sum			
	Radios for communication	Sum			
	Rigging ropes/slings	Sum			
	Crane operators	Month			
	Riggers	Month			
	Nylon & polyester web slings	Sum			
Construction employee Facilities:					

	Toilets	Sum			
	Maintenance of toilets				
	Changing facilities for each sex	Sum			
	Sheltered eating areas	Sum			
	Sufficient cleaning implements (brooms etc.)	Month			
	Waste bins	Sum			
	Soap	Month			
	Toilet paper	Month			
	Lockers	Sum			
Occupational Hygiene:					
	Appointment of AIA	Sum			
	Occupational Hygiene Surveys	Sum			
Hazardous Chemicals substances					
	HCS / Flammable liquid store	Sum			
	HCS controller	Sum			
	Fire extinguishers	Sum			
	Spill kits	Sum			
	Signage	Sum			
Waste Management:					
	Drip trays	Month			
	Colour Coded dust bins	Sum			
	Refuse removal service provider	Month			
Confined spaces:					
	3 Oxygen meters	Sum			
	Calibration of oxygen meters	Month			
	Training: use of oxygen meters	Sum			
	Emergency equipment	Sum			
	Extractor fans	Sum			
	Force fans	Sum			
	Safety Harnesses	Sum			
	Lifelines	Sum			
	Other				
Dangerous Animals:					
	Snake handling training	Sum			
	Snake handling equipment	Sum			
Working close to or with sewage / Effluent					
	Hepatitis B injections.	Sum			
Removing Asbestos material					
	AIA to be appointed (survey to be conducted)	Sum			
	Air monitoring	Sum			
	Asbestos training	Sum			
	Special PPE	Sum			
	Asbestos Contractor	Sum			
	Removing, stacking, and storing of asbestos material	Sum			
	Transport and disposal of asbestos material	Sum			
Other					

REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS

BASELINE RISK ASSESSMENT

Section of the Works:	REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS
RA Area:	Vreder WWTW are 27° 23' 59" S, 29° 10' 52" E.
RA Revision Date:	N/A
RA Revision:	0

Project:	REFURBISHMENT OF VREDE / THEMBALIHLE WASTEWATER TREATMENT WORKS
Project No:	

Approval	Name	Designation	Registration Number	Signature	Date
Drafted by					
Approved by					

Number	Task / Activity	Hazard / Aspect (What are the danger)	Impact/Risk (What can go wrong)	Health or Safety	Legal Compliance (Y or N)	Normal(N) Abnormal(A) Emergency(E) N / A / E	Likelihood / Probability	Exposure	Severity	Risk Rating	Significance	Recommended steps for controlling Hazard
Pre-Construction												
PEOPLE												
1.	Designer procurement and services	Incompetent, not registered with professional body, inadequate resources,	Inadequate design. Registration invalid. Cannot complete project.	Health and Safety	Y	N	3	6	5	90	M	Pre-construction: Designer to provide valid proof of registration with professional body. Declare competency and that adequate resources is available. Comply with CR 6.
2.	Consultants and specialists procurement and services	Incompetent, not registered with professional body, inadequate resources,	Inadequate consultant/ specialist services. Registration no longer valid. Cannot see project to completion.	Health and Safety	Y	N	3	6	5	90	M	Pre-construction: Consultants/ specialists to provide proof of valid registration. Declaration of competency and adequate resources. Assist in the design for their specific discipline and indicate unsafe aspects thereof.
3.	Principal contractor procurement and services	Incompetent, no letter of good standing, no public liability insurance, not adequate resources, not provided for cost of H&S measures, no safety plan, no safety file, safety plan not approved,	Construction work of inferior quality (even collapse thereof). Injured workers not receiving proper medical care. Construction project not completed. Incidents accidents and property damage due to lack of funds or equipment. Breach of laws/ regulations, no H&S commitment, no safety system to eliminate/ mitigate unsafe acts or conditions.	Health and Safety	Y	N	6	10	5	300	VHR	Pre-construction: Principal contractor to provide proof of competency, an adequate H&S plan and file that passes client audit. The client must prove that adequate resources is available to ensure safe construction and provision for H&S measures was made in cost estimates.

4.	Competency	Incompetent	Non- Compliance to Legal Requirements. Personal Injury. Public Liability. Unskilled/ untrained. Not informed.	Health and Safety	Y	N	6	10	5	300	VHR	Pre-construction: Identify the H&S training that will be required for the project and make provision for the costs involved.
5.	Legal Authority, Roles and Responsibilities and Accountabilities	Major non-conformance to Legal Requirements	Non- Compliance to Legal Requirements. Personal Injury. Public Liability. Unskilled/ untrained. Not informed.	Health and Safety	Y	N	6	6	5	180	H	Pre-construction: Legal Liability training and Awareness. Risk Communication and strategy. Legal appointments completed and signed with proof of competency.
6.	Incapability	Not medical fit as per Legal Requirements	Incapability. Not fit for work (medical and Psychological)	Health and Safety	Y	N	3	6	5	90	M	Pre-construction: develop a system to ensure medical surveillance, testing and record keeping is conducted.
7.	Unskilled	Incompetent	Non- Compliance with Legal Requirements. Personal Injury. Public Liability. Unskilled/ untrained. Not informed.	Health and Safety	Y	N	6	6	5	180	H	Pre-construction: Legal Liability training and Awareness. Risk Communication and strategy. Legal appointments completed and signed with proof of competency.
8.	Compulsory community labour use	Disputes, rioting, picketing, arson, vandalism.	Non- Compliance with Legal Requirements. Personal Injury. Public Liability. Unskilled/ untrained. Not informed.	Health and Safety	Y	A	6	3	4	72	M	Pre-construction: Community leader involvement. Memorandum of understanding. Community to be informed regarding the OHS requirements.
9.	Employee Transport	Accident to/ from site	Personal injury, damage to vehicles, public liability insurance. Under influence of intoxicating substances.	Safety	Y	N	6	6	5	180	H	Pre-construction: Transporter verify PDP. Licence and serviced vehicles. LDV vehicles fitted with seats and seat belts
EQUIPEMENT												
10.	Equipment Transport to site. Delivery and Off-loading.	Road accidents, off-loading accidents	Loss of material/ equipment. Personal injury, damage to vehicles. Public Liability insurance. Under influence of intoxicating substances	Safety	Y	N	6	6	5	180	H	Pre-construction: Dedicated designated off-loading areas to be established. Vehicle road-worthiness tested. Insurance for damage/ loss of loads. Required PDP and licences obtained. Competent driver assigned.
11.	Stacking and Storage	Un-levelled laydown areas, unsafe height/ width ratio, laydown/ rubble areas not demarcated, unsafe stacking/ tools at work area, tripping hazard, unsafe Hazchem storage, unsafe storage of flammable material	Damage to equipment/ material/ property. Personal injury to workers/public, fire	Safety	Y	N	6	3	3	54	M	Pre-construction: Appoint a competent person to verify all stacking and storage activities. Plan and designate the laydown area/s. Ensure laydown area is relatively flat and able to take intended loads. Demarcate and barricade the area/s. Display signage. Develop stacking and storing inspection registers.
12.	Construction Vehicles & Mobile plant	Unauthorised operators, operators not trained, vehicles not suitable for the job, vehicles not road worthy, vehicles on site not accompanied by flagmen. No reverse alarms, defective rotate lights.	Vehicle accidents, vehicles falling into excavated areas , vehicles hitting employees on site, noise, pollution	Safety	Y	N	3	6	5	90	M	Pre-construction: Traffic Management Plan to be developed to ensure that construction vehicles / mobile plant are properly organized and controlled. Equip construction vehicles with acoustic warning device. Equipped construction vehicles with a automatic acoustic reversing alarm. Maintenance records to be obtained. Appoint a driven machinery supervisor to supervise driven machinery. Appoint all operators. Operators must be specifically trained to operate particular construction vehicles / mobile plant. Operators must be in possession of a certificate of training issued by a accredited training provider . Conduct medical certificates fitness in the form of a annexure 3.

13.	Lifting Machines	Defective lifting machines .Lifting machines not load tested ,Incompetent operator.	Loads can fall, Cranes can fall over causing severe injuries and damaged.	Safety	Y	N	3	6	5	90	M	Pre-construction: All lifting machines to be constructed in accordance with acceptable technical standards. Ensure safe work loads are conspicuously displayed, identification plates are displayed. Ensure that it has at least three full turns of rope on the drum . Obtain load test certificates not exceeding 12 months and ensure that it is up to date and still valid. Full service history records to be obtained. Crane operators and riggers to be appointed in writing. Competency certificates and medical certificates of fitness to be verified. Operators must be specifically trained to operate a particular lifting machine. Operators must be in possession of a certificate of training issued by a training provider accredited at the Transport Seta. Generate inspection registers for all lifting machines.

14.	Lifting Equipment	Defective lifting equipment .Lifting equipment not load tested. Using insufficient lifting equipment.	Lifting equipment can fail, loads can fall and cause severe injuries and damage.	Safety	Y	N	6	6	5	180	H	Pre-construction: All chains and ropes that form part of the load path of the lifting machine to have a factor of safety provided to the standard to which the machine was manufactured. Hooks or any other load attaching devices shall be designed or proportioned that accidental disconnection cannot take place. Verify that ropes, chains, hooks, other attaching devices ,sheaves, brakes and safety devices went through a thorough examination by a competent person not exceeding six months. Generate registers for all lifting equipment. Place all lifting equipment on registers with serial numbers and test certificates.
15.	Hand tools	Cuts bruise, Amputations of limbs/ body parts. Equipment failure. Cracked and chipped (mushroomed) tools, Unsafe operating practice. Wrong, Incorrect tools for task used.	Injuries, noise induced hearing loss, respiratory problems (Silicosis in lungs). Ergonomic injury.	Safety	Y	N	3	6	3	54	M	Pre-construction: RA and SWP to be compiled and communicated to all involved.
16.	Use and operate portable electrical equipment	Hand Arm vibration. Noise. Cuts bruise, Amputations of limbs/ body parts. Equipment failure. Electrical shock. Cracked housing. Unsafe cables. Unsafe operating practice.	Electrical shocks, Severe injuries, noise induced hearing loss, respiratory problems (Silicosis in lungs). Ergonomic injury. Environmental pollution	Health and Safety	Y	N	3	6	3	54	M	Pre-construction: Generate specific method Statement, RA and SWP for portable electrical tools. Method statement, RA and SWP to be communicated to all involved. Conduct PTO's on all employees using portable electrical equipment. Where reasonably practicable use only equipment with sound levels below 85Db (A).
17.	Use of ladders	Defective ladders. Incorrect use of ladders. Improper storage of ladders.	Ladders can break, causing employees to fall from ladders. Ladders can fall over causing employees to fall to ground. Employees can fall from ladders.	Safety	Y	N	3	6	3	54	M	Pre-construction: Appoint a ladder inspector. Number all ladders (fixed and portable). Generate ladder register. Train employees in the correct usage of ladders.
18.	Generators	Noise, Leaking fuel, Hot engine	NIHL, Burns, fire, electric shock. Slipping on spilled fuel.	Health and Safety	Y	N	3	6	3	54	M	Pre-construction: Number all generators . Generate register for generators . Obtain drip trays for all generators. Develop a detailed safe operating procedure and communicate with employees.
19.	Welders / Flame cutters	Electricity, Welding/cutting fumes and gasses . Excessive heat. UV and IR radiation	Electric shock, Inhalation of fumes and gasses. Burnes. Fires. Explosions	Health and Safety	Y	N	6	6	3	108	H	Pre-construction: Appoint supervisor to supervise welding and flame cutting operations. Develop a specific method statement, RA and SWP for welder and flame cutting equipment. Train operators in the safe operation of welders and flame cutting equipment. Issue employees with the correct PPE. Provide proper ventilation for welding, flame cutting operations.
20.	Concrete Mixers	Moving parts, cement , cement dust. Noise	Inhalation of dust. Concrete splashes in the eyes. NIHL . Personal injuries.	Health and Safety	Y	N	3	6	4	72	M	Pre-construction: Develop method statement, risk assessment and SWP for the use of concrete mixers. Train concrete mixers in the safe operation of concrete mixers. Provide employees with the correct PPE. Number concrete mixers and generate inspection checklists. Ensure that all moving parts is sufficiently closed with machine guards.
21.	Compressed Air Tools (Pressurised Equipment)	Excessive noise, compressed air injury (pepper wounds). Dust and Air pollution. Flushing using hoses. Hose bursts (snaking).	Personal Injuries, eye injuries, noise induced hearing loss.	Safety	Y	N	6	2	5	60	M	Pre-construction: Pressure tests as per legal requirement. Place pressure test results and certificates on safety file

22.	Hammer breakers	Noise, Vibration, crystalline silica. Dust, fumes & airborne material. Heat. Electricity	Breaking, drilling, hammering, or other activities involving rock, concrete, asphalt or other materials may cause silicosis. Vibration may cause, contribute to, or aggravate injury or disorders to the operator's fingers, hands, wrists, arms, shoulders and/or other body parts. Noise Induced hearing loss.	Health and Safety	Y	A	6	3	4	72	M	Pre-construction: All existing services should be located and made safe. Employees to be issued with the correct PPE. Hammer breakers to be placed on registers. Operators to be trained in safe operation of breakers. Method statement, risk assessment and SOP to be developed and communicated with employees.
PROCESS												
23.	Design	Not complying with SANS Standards, not taking H&S specification into consideration, not providing client with pre-tender report, not notifying client of construction H&S hazards and mitigation thereof, including hazardous processes and materials in the design, not including maintenance considerations in the design, not doing inspections mandated by the client, not taking ergonomics into consideration during design	Not detecting hazards during design, not complying with specification, H&S costs not reaching contractor/s, Geotech aspects not considered, injury to workers and damage to property, hazardous materials causing injury, diseases, fire or property damage, causing unsafe maintenance during operation stage, unsafe conditions during construction not rectified, ergonomic disease during construction and operations stages.	Health and Safety	Y	N	3	6	5	90	M	Pre-construction: Include SANS Standards into designs, consider the H&S Spec during design, and include H&S information and Geotech information in the client report. Include ergonomic principals in the design. Abstain from using dangerous processes and materials in the design.
24.	Clearing and grubbing, vegetation clearance.	Moving machinery, Dangerous snakes	Personal Injuries. Vehicle accidents , bitten by dangerous snakes.	Safety	Y	A	6	6	4	144	H	Pre-construction: Traffic Management Plan to be developed to ensure that construction vehicles / mobile plant are properly organized and controlled. Appoint a driven machinery supervisor to supervise driven machinery. Appoint all operators. Operators must be specifically trained to operate particular construction vehicles / mobile plant. Appoint and train employees to handle dangerous snakes. Obtain equipment to handle dangerous snakes. Get in contact with hospitals and emergency services that can assist with possible snake bites. Develop a detailed emergency response plan for snake bites.
25.	Excavations	Unstable soil condition, not battered sides of excavation, not shored/ braced, placing load on excavation edge, mobile plant movement, not inspecting excavation condition, not barricading edges. Ground water seeping through excavations.	Collapse of excavation, inundation of excavations, mobile plant falling into excavation. Property damage. Fatal injury to person/s. persons falling into excavation causing injury	Safety	Y	A	10	6	5	300	VHR	Pre-construction: Geotechnical report to be issued to contractors. Competent excavation supervisor to be appointed in writing. Excavation inspection register to be developed. Develop a method statement, risk assessment ,safe working procedure and emergency evacuation plan in case of a collapse and communicate with employees.
26.	Bedding & Backfilling	Placing load on excavation edge, mobile plant movement. Employees compacting material. Vibration, noise, dust	Collapse of excavation sidewalls ,mobile plant falling into excavation. Property damage. Inhalation of dust, NIHL.	Health and Safety	Y	A	6	6	5	180	H	Pre-construction: Method statement, risk assessment and SWP to be developed and communicated with employees. Depending on if excavations is battered or shored the contractor must indicate a safe working distance to prevent any load, material, plant or equipment is moved or placed on the edges of the excavation.

27.	Lifting operations	Base unstable, unsafe erecting, unsafe operation, crane boom radius not known, operator untrained, working under suspended load, unsafe rigging practices, damaged slings	Crane collapse. Crane boom fall. Crane boom damaging property. Falling loads. Workers on site not moving out of slew path. Load falling due to poor rigging. Sling breaking under load causing load falling and injuring persons.		Y	A	6	6	5	180	H	Pre-construction: Method statement, risk assessment and SWP to be developed and communicated with employees. Crane operators and Competent riggers to be appointed in writing. Ways of communication to be established (two way radios) Crane radius and slew path correctly designed and restricted where required. Depending on if excavations is battered or shored the contractor must indicate a safe working distance to prevent any load, material, plant or equipment is moved or placed on the edges of the excavation. Generating inspection registers for lifting machines and equipment.
28.	Welding & Flame cutting	Electricity, Welding/cutting fumes and gasses . Excessive heat. UV and IR radiation	Electric shock, Inhalation of fumes and gasses. Burnes. Fires. Explosions	Health and Safety	Y	A	3	6	4	72	M	Pre-construction: Appoint supervisor to supervise welding and flame cutting operations. Develop a specific method statement, RA and SWP for welder and flame cutting equipment. Train operators in the safe operation of welders and flame cutting equipment. Issue employees with the correct PPE. Provide proper ventilation for welding, flame cutting operations.
29.	Grinding & Cutting	Cracked grinding disc. Wrong cutting /grinding dis. Unsafe cables. Unsafe operating practice. Defective grinding machine . Noise. Sparks	Noise. Cuts bruise, Amputations of limbs/ body parts. Equipment failure. Electrical shocks, Flying pieces causing severe injuries. Burns		Y	A	3	6	4	72	M	Pre-construction: Method statement ,RA and SWP to be developed and communicated with employees. Grinders and grinding discs to be placed on inspection registers. PTO's to be conducted on employees using grinders.
30.	Cathodic protection	Working in excavated areas.	Collapse of sidewalls.	Safety	Y	A	3	6	4	72	M	Pre-construction: Method statement ,RA and SWP to be developed and communicated with employees.
31.	Steel fixing	Sharp edges, sharp points, off cuts, wire cuts	Injuries, cuts and bruises, eye injuries, pollution		Y	A	6	6	2	72	M	Pre-construction: Reinforcing steel drawings and proper design. Method statement, RA and SWP to be developed and communicated with employees.
32.	Working at Fall Risk Positions	Unsafe installation. Incompetent installers, inspectors. Unsafe design. Incompetent users. Unsafe behaviour. Failure of equipment, and material. Not using PPE (Safety harness).	Falling to lower elevation, temporary structure collapsing/falling over, falling onto. Falling through. Falling down.	Safety	Y	A	6	6	5	180	H	Pre-construction: Fall protection plan to be developed and communicated. Fall protection risk assessment to be developed and communicated . Checklist and/or registers to be compiled.
33.	Scaffolding material	Inadequate scaffold material, Incompetent erectors and inspectors . Unsafe scaffolding	Scaffolding can collapse. Employees falling from scaffolding.		Y	A	6	6	5	180	H	Pre-construction: Competent scaffold supervisor to be appointed. Competent erectors and inspectors to be appointed.
34.	Tie-in: to existing services	Tie-in done by incompetent person/s. Damage to existing services. Damage done to Vrede WWTW plant installations. Tie in when upgraded portions of plant are still in operation.	Injury to person/s. Extensive damage to equipment and property / personal injuries, damages to existing structures or equipment.	Safety	Y	A	6	6	5	180	H	Pre-construction: Liaise Koofiefontein WWTW control room on tie-in positions. Follow the Vrede WWTW isolation and permit procedure. Ensure persons to do tie-in connections are competent. Co-ordinate with Vrede WWTW control room for lockout where applicable. Obtain permit to work . Clarify the duration of the shutdown (12 hour,24 hours) Develop detailed method statement, RA and SWP for Tie in to existing services. Develop and communicate lock out procedure.

35.	Electrical and Mechanical works.	Electricity	Electrical shocks, Severe injuries (burns).	Safety	Y	N	6	6	5	180	H	Pre-construction: Co-ordinate with Vrede WWTW control room for lockout where applicable. Obtain permit to work . Clarify the duration of the shutdown (12 hour,24 hours) Develop detailed method statement, RA and SWP for electrical and mechanical works. Develop and communicate lock out procedure.
36.	Working in Confined spaces	Oxygen Deficiency. Oxygen Enrichment. Excessive Heat. Toxic Atmosphere. Flowing Liquid	loss of consciousness, injury or death from contaminants in the air. Suffocation from oxygen deficiency.	Safety	Y	A	10	6	5	300	VHR	Pre-construction: Specific method statement, risk assessment and SOP to be generated and communicated with employees. A competent person to be appointed to test the air in a confined space. The Contractor to comply with all the requirements as specified in the GSR 5. Follow the Vreded WWTW isolation and permit procedure.
37.	Improve access roads	Asphalt, excessive heat, mobile plant	Throat and eye irritation, Fatigue, cough, and skin cancer. Struck by driven machinery. Vehicle accidents. Personal injuries.	Health and Safety	Y	A	6	6	5	180	H	Pre-construction: Traffic Management Plan to be developed to ensure that construction vehicles / mobile plant are properly organized and controlled. Equip construction vehicles with acoustic warning device. Equipped construction vehicles with a automatic acoustic reversing alarm. Maintenance records to be obtained. Appoint a driven machinery supervisor to supervise driven machinery. Appoint all operators. Operators must be specifically trained to operate particular construction vehicles / mobile plant. Operators must be in possession of a certificate of training issued by a accredited training provider . Conduct medical certificates fitness in the form of a annexure 3. Issue employees with the correct PPE. Develop a detailed method statement, risk assessment and SWP and communicate to employees. Train employees in the correct usage of PPE.
38.	Improvements of existing services	Saw cut, break out, treat exposed concrete face and exposed reinforcing . Construct new tension beams	Damages to existing structures. Collapse of existing structures . Severe injuries .personal injuries	Safety	Y	A	6	6	4	144	H	Pre Construction: Co-ordinate with Vrede WWTW control room for lockout where applicable. Obtain permit to work . Clarify the duration of the shutdown (12 hour,24 hours) Method statement, risk assessment and SWP to developed and communicated with employees. Follow the Vrede WWTW isolation and permit procedure.
39.	Wet trades	Wet concrete, repetitive movements, cement dust, hazardous chemical, polluting environment. Heavy lifting, lifting to higher level.	Inhalation of cement, silicosis, dermatitis. Muscle strain. Environmental pollution.	Safety , Health and Environment	Y	A	3	6	3	54	M	Pre-construction: Compile a checklist to check support and formwork before, during and after pouring concrete. Prepare Method statement
MATERIAL												

40.	In Sutu material	Placing load on excavation edge, mobile plant movement. Employees compacting material. Vibration, noise, dust	Collapse of excavation sidewalls ,mobile plant falling into excavation. Property damage. Inhalation of dust, NIHL.	Health and Safety	Y	A	6	6	5	180	H	Pre-construction: Method statement, risk assessment and SWP to developed and communicated with employees. Depending on if excavations is battered or shored the contractor must indicate a safe working distance to prevent any load, material, plant or equipment is moved or placed on the edges of the excavation.
41.	Grinding discs	Cracked grinding disc. Wrong cutting /grinding dis.	Discs can break resulting into flying pieces.	Safety	Y	A	6	6	4	144	H	Pre-construction: Method statement ,RA and SWP to be developed and communicated with employees. Grinders and grinding discs to be placed on inspection registers. PTO's to be conducted on employees using grinders.
42.	Interconnecting pipe work.	Improper stacking of pipes . Improper lifting . Improper handling	Personal injuries. Damages	Safety and Health	Y	A	6	6	5	180	H	Pre-construction: Appoint a competent person to verify all stacking and storage activities . Plan and designate the laydown area/s. Ensure laydown area is relatively flat and able to take intended loads. Demarcate and barricade the area/s. Display signage. Develop stacking and storing inspection registers. All pipes to be stacked on sand bags
43.	Concrete	Wet concrete, repetitive movements, cement dust, hazardous chemical.	Inhalation of cement dust, silicosis, dermatitis.	Safety , Health and Environment	Y	A	3	6	3	54	M	Pre-construction: MSDS to be obtained. Employees to be trained in MSDS .
44.	Signage	Emergency, directive, fire equipment position signage not displayed	Chaotic conditions existing in emergency situations	Safety	Y	A	6	3	3	54	M	Pre-construction: Provide required signage in sufficient quantities.
45.	Reinforcing steel	Sharp edges, sharp points, off cuts, wire cuts	Injuries, cuts and bruises, eye injuries, pollution	Safety	Y	A	6	6	2	72	M	Pre-construction: Reinforcing steel drawings and proper design.
46.	Chlorine & Chlorine storage tanks	Highly corrosive in moist conditions. Strong oxidiser. Chlorine fumes.	Irritating throat, skin and eyes. Cause chest pains. Higher levels can burn lungs and cause fluids in the lungs. Contact can severely burn eyes and skin. Not flammable but strong oxidiser and will support burning of combustible material.	Health and Safety	Y	A	6	3	4	72	M	Pre-construction: Ensure that new chlorine building is cool, dry and well ventilated. Ensure that sufficient space is provided to secure cylinders. Ensure that aluminium, brass, copper, manganese, tin and steel is not stored wit chlorine. Ensure that it is not stored with nitrogen compounds. Install a system of local or exhaust installation. Use a enclosed and isolated system if possible. Issue employees with the correct PPE. Training employees in the correct handling and storage of chlorine. Communicate MSDS with employees.
47.	Bricks	Rough brick surfaces, unnatural postures, repetitive movements, poor stacking.	Twisting and straining of back muscles. Hand injuries. Stack collapse on top of worker.	Safety	Y	N	6	3	3	54	M	Pre-construction: Laydown for bricks. Stable stacking when delivered
48.	Removing asbestos material	Exposure to airborne concentrations of asbestos dust and fibres.	Exposure to airborne concentrations of asbestos dust and fibres can cause Asbestosis, Lung Cancer and Mesothelioma.	Health	Y	N	6	3	4	72	M	Pre-construction: Notify the provincial director in writing of the asbestos work to be carried out. Adequately and comprehensively inform and train employees. Conduct an assessment of potential exposure. Develop a method statement, risk assessment and safe working procedure and communicate with employees.

49.	Reinforced concrete & Steel grating walkways.	Hand tools used incorrectly. Exposure to hazardous materials, dust and toxic vapours. Slip, trip and fall hazards. Not using correct PPE. Incorrect lifting techniques.	Hand injuries. Injuries to persons. Occupational disease, back injuries. Employees falling from structures.	Safety	Y	N	3	3	4	36	L	Pre-construction: designer to exclude dangerous materials or substitute with less dangerous materials.
ENVIRONMENT/ CONDITIONS and HYGIENE												
50.	Site Facilities	Sleeping on site, Ablution, sanitation, Changing and washing facilities inadequate. Eating and Resting areas.	Non-Conformance to Legal Requirements as per Construction and Facilities Regulations. Eating on-site (diseases site contamination/ pollution).	Safety and Health	Y	N	3	6	3	54	M	Pre-construction: Toilets, ablutions, changing and washing facilities, eating/ resting areas with waste management planned for the number of employees expected at peak
51.	Occupational Hygiene	Occupational Hygiene stressors, Loss of production, Diseases, contamination,	Diseases, Occupational Hygiene, Medical Surveillance, Toxicology/ Hazardous Chemicals, Biological Stress, Noise Induced Hearing Loss, Radiation.	Safety and Health	Y	N	6	6	3	108	H	Pre-construction: Medical Surveillance Systems, AIA Assessments and Control measures, Hazardous Chemical stacking, storage and monitoring, Noise Induced Hearing Loss control measures, Soil Compacting Testing equipment controls (i.e. Troxler's) planned for the project.
52.	Hazardous Chemicals	Flammable, Pollution, Explosion, Toxic,	Fire, Explosion, Toxic, Diseases, Environmental Pollution,	Safety and Health	Y	N	3	6	3	54	M	Pre-construction: Hazardous Chemical Controls (Engineering and Admin), Waste Management planning for project
53.	Climate	Adverse/ Abnormal rainfall, Heat stress, Cold stress,	Flooding, Heat stress, Cold Stress, Loss of production,	Safety and Health	Y	N	6	6	3	108	H	Pre-construction: Inclement weather procedure compiled. Sufficient, suitable Personal Protective Equipment (clothing) planned for cold stress and rain conditions. Safe to use potable /drinking water availability for site planned.
54.	Housekeeping, stacking, storage	Un-levelled laydown areas, unsafe height/width ratio, laydown/rubble areas not demarcated, unsafe stacking/tools at work area, tripping hazard, unsafe Hazchem storage, unsafe storage of flammable material	Damage to equipment/material/property, personal injury too workers/public, fire	Safety and Health	Y	N	6	6	3	108	H	Pre-construction: Compile a RA, SWP and waste management plan and communicate it to all involved. Include the EIA recommendations in the plan.
55.	Access and Egress Routes to/ from site	Inadequate, Unidentified. Public. Pedestrians.	Collisions. Loss of production. Pollution. Public Liability (claims).	Safety and Health	Y	N	6	6	5	180	H	Pre-construction: Traffic Management Plan. Wayleave.
56.	Perimeter fencing and hoarding.	Theft, Vandalism, loss of production, Unauthorised persons enter site.	Theft, Loss of Production, damage, arson, Injury to public,	Safety and Health	Y	N	6	6	5	180	H	Pre-construction: Plan type, position and height of fence/ hoarding.
57.	Site Topography (Slope)	Run-away vehicles, slipping and falling ,	Damage to equipment/material/property, personal injury too workers/public,	Safety and Health	Y	N	3	6	3	54	M	Pre-construction: Vehicles pre-use inspection re. brake tests.
58.	Emergency and Evacuation	No plan, no alarm, escape way not demarcated, no assembly point, no first aid equipment, no firefighting equipment, no trained fire fighters.	Injury, burns, persons unable to escape, persons not knowing where to assemble (chaos), injured not treated, fire not extinguished (in case the emergency is a fire), nobody able to extinguish a fire.	Safety and Health	Y	N	6	6	5	180	H	Pre-construction: Compile A detailed an emergency/ evacuation and response plan and communicate it to all persons on site (induction training). Train sufficient firefighters, first aiders and emergency controllers. Display emergency numbers. Liaise with local hospitals and emergency services to ensure sufficient response.

59.	Leaking sewage / effluent	Working with or in leaking sewage / effluent.	Diarrhea, fever, cramps, and sometimes vomiting, headache, weakness, or loss of appetite	Health	Y	A	6	6	4	144	H	Pre-construction: All employees to get Hepatitis B injections. Conduct a risk assessment for employees working in or with leaking effluent/sewage. Train employees in terms of the requirements as specified in the regulations for hazardous biological agents section 4. Implement a suitable procedure that is standardized to monitor the exposure to leaking effluent /sewage. Issue employees with the correct PPE.
60.	Dangerous Animals	Dangerous snakes and bees.	People getting bitten by snakes or stung by bees.	Safety	Y	A	6	6	5	180	H	Pre-construction: Appoint and train employees to handle dangerous snakes. Obtain equipment to handle dangerous snakes. Get in contact with hospitals and emergencies that can assist with possible snake bites. Develop a detailed emergency response plan for snake bites.
FINANCIAL												
61.	Cost for H&S requirements	No funds for: formal and informal training, PPE, stationary, printing, notice boards, signage, first aid equipment, firefighting equipment, facilities, lifting tackle certification, medical surveillance, load testing, COC temporary electricity.	Lack of the following on the project: formal and informal training, PPE, stationary, printing, notice boards, signage, first aid equipment, firefighting equipment, facilities, lifting tackle certification, medical surveillance, load testing, COC temporary electricity.	Safety, Health and Environment	Y	N	6	6	4	144	H	Pre-construction: Plan for funding of: formal and informal training, PPE, stationary, printing, notice boards, signage, first aid equipment, firefighting equipment, facilities, lifting tackle certification, medical surveillance, load testing, COC temporary electricity.
LEGAL												
62.	Legal Framework for Project	Not complying with legislation, regulations and standards	Court cases against project, fines, imprisonment	Safety, Health and Environment	Y	N	6	10	5	300	VHR	Pre-construction: Compile a legal framework of all Acts, regulations and standards that have effect on the project and understand the impact thereof on the project
CONSTRUCTION												
PEOPLE												
63.	Designer procurement and services	Incompetent, not registered with professional body, inadequate resources,	Inadequate design. Registration invalid. Cannot complete project.	Safety, Health and Environment	Y	N	3	6	5	90	M	Construction: Amend plans where required. Inform client and principal contractor of changes and safety measures to take to do work safely. Do regular inspections.
64.	Consultants and specialists procurement and services	Incompetent, not registered with professional body, inadequate resources,	Inadequate consultant/ specialist services. Registration no longer valid. Cannot see project to completion.	Safety, Health and Environment	Y	N	3	6	5	90	M	Construction: Inspect work done for their specific discipline. Indicate unsafe or sub-standard work.
65.	Principal contractor procurement and services	Incompetent, no letter of good standing, no adequate resources, not provided for cost of H&S measures, no safety plan, no safety file, safety plan not approved,	Construction work of inferior quality (even collapse thereof). Injured workers not receiving proper medical care. Construction project not completed. Incidents accidents and property damage due to lack of funds or equipment. Breach of laws/ regulations, no H&S commitment, no safety system to eliminate/ mitigate unsafe acts or conditions.	Safety, Health and Environment	Y	N	6	10	5	300	VHR	Construction: Provide contractors with their part of the H&S specification, ensure contractor safety files are legally compliant, approve safety plans and files, stop unsafe work executed by contractors, provide induction training for all on site, secure access to site, ensure contractors are in good standing with the compensation commissioner, keep safety records updated.
66.	Competency	Incompetent	Non- Compliance to Legal Requirements. Personal Injury. Public Liability. Unskilled/ untrained. Not informed.	Safety, Health and Environment	Y	N	6	10	5	300	VHR	Construction: Legal Liability training and awareness programmes implemented. Implement Safety and Health Management Plan. Risk Communication and Awareness strategy implemented.

67.	Legal Authority, Roles and Responsibilities and Accountabilities	Major non-conformance to Legal Requirements	Non- Compliance to Legal Requirements. Personal Injury. Public Liability. Unskilled/ untrained. Not informed.	Safety, Health and Environment	Y	N	6	6	5	180	H	Construction: Manage and supervise tasks and operations. Discipline where required. Manage H&S systems and records.
68.	Incapability(Fitness for work)	Not medical fit as per Legal Requirements	Incapability. Not fit for work (medical and Psychological)	Safety and Health	Y	N	3	6	5	90	M	Construction: Implement Medical Surveillance Program. All employees on construction site is medically fit as per legal requirement. Tests by Occupational Medical Practitioner done, Annexure 3 medical certificates by Registered OMP obtained and kept on file.
69.	Compulsory community labour use	Disputes, riot, picketing, arson, vandalism.	Non- Compliance with Legal Requirements. Personal Injury. Public Liability. Unskilled/ untrained. Not informed.	Safety	Y	A	6	3	4	72	M	Construction: Dispute resolution, training, awareness, supervision and security.
70.	Employee Transport	Accident to/ from site	Personal injury, damage to vehicles, public liability insurance. Under influence of intoxicating substances.	Safety	Y	N	6	6	5	180	H	Construction: People not transported together with equipment. Random substance abuse checks. Vehicle condition checks. Regular maintenance on vehicles.
EQUIPMENT												
71.	Equipment Transport to site. Delivery and Off-loading.	Road accidents, off-loading accidents	Loss of material/ equipment. Personal injury, damage to vehicles. Public Liability insurance. Under influence of intoxicating substances	Safety	Y	N	6	6	5	180	H	Construction: Load secured. Vehicles serviced/ maintained. No Overloading. Loads balanced. Traffic Management Plan to be implemented. Speed limit obeyed. Equipment to be offloaded by competent, assigned staff. Lifting Equipment use; as per legal requirements.
72.	Stacking and Storage	Un-levelled laydown areas, unsafe height/ width ratio, laydown/ rubble areas not demarcated, unsafe stacking/ tools at work area, tripping hazard, unsafe Hazchem storage, unsafe storage of flammable material	Damage to equipment/ material/ property. Personal injury to workers/public, fire	Safety	Y	N	6	3	3	54	M	Construction: Stack material properly. No stacking allowed outside the planned laydown area. Control delivery and off-loading. Follow manual handling safety rules.
73.	Construction Vehicles	Unauthorised operators, operators not trained, vehicles not suitable for the job, vehicles not road worthy, vehicles on site not accompanied by flagmen. No reverse alarms, defective rotate lights.	Vehicle accidents, vehicles falling into excavated areas , vehicles hitting employees on site, noise, pollution	Safety	Y	N	3	6	5	90	M	Construction: Implement traffic management plan. Inspect all vehicles and mobile plant before use. Inspection registers to be signed by the operator and driven machinery supervisor. Flagman to control traffic to and from site entering public roads. Required PPE to be used. Regular maintenance on mobile plant and lifting equipment. Use drip trays to prevent pollution. Practice dust allaying where relevant. Demarcate roadways and separate walkways. Control vehicle speed.
74.	Lifting Machines	Defective lifting machines .Lifting machines not load tested ,Incompetent operator.	Loads can fall, Cranes can fall over causing severe injuries and damaged.	Safety	Y	N	3	6	5	90	M	Construction: All lifting machines to be inspected before use. Inspection checklist to be completed and signed by the operator and supervisor. Deviations or defects to be reported immediately and rectified. If not possible lifting machines to be removed from site until fully compliant. A excavator is not classified as a lifting machine. Excavators shall not be used as a lifting machine.

75.	Lifting Equipment	Defective lifting equipment .Lifting equipment not load tested. Using insufficient lifting equipment.	Lifting equipment can fail, loads can fall and cause severe injuries and damage.	Safety	Y	N	6	6	5	180	H	Construction: All lifting equipment to be inspected before use. Inspection checklist to be completed and signed by the operator and supervisor. Damaged lifting equipment to be removed from site immediately.
76.	Use of Hand Tools	Cuts bruise, Amputations of limbs/ body parts. Equipment failure. Cracked and chipped (mushroomed) tools, Unsafe operating practice. Wrong, Incorrect tools for task used.	Injuries, noise induced hearing loss, respiratory problems (Silicosis in lungs). Ergonomic injury.	Safety	Y	N	3	6	3	54	M	Construction: Checklist and/or registers to be completed regularly by competent staff. Required PPE to be used. Comply with relevant regulation requirements.
77.	Use and operate portable electrical equipment	Hand Arm vibration. Noise. Cuts bruise, Amputations of limbs/ body parts. Equipment failure. Electrical shock. Cracked housing. Unsafe cables. Unsafe operating practice.	Electrical shocks, Severe injuries, noise induced hearing loss, respiratory problems (Silicosis in lungs). Ergonomic injury. Environmental pollution	Health and Safety	Y	N	3	6	3	54	M	Construction: Checklist and/or registers to be completed regularly by competent staff. All Portable Electrical Power Tool to be maintained and/or repaired. Required PPE to be used. Comply with relevant regulation requirements.
78.	Use of ladders	Defective ladders. Incorrect use of ladders. Improper storage of ladders.	Ladders can break, causing employees to fall from ladders. Ladders can fall over causing employees to fall to ground. Employees can fall from ladders.	Safety	Y	N	3	6	3	54	M	Construction: Inspect ladders before use . Ladders to be secured by assistant when someone is working on a ladder. Never climb up and down ladders with tools and equipment in hands.
79.	Generators	Noise, Leaking fuel, Hot engine	NIHL, Burns, fire, electric shock. Slipping on spilled fuel.	Health and Safety	Y	N	3	6	3	54	M	Construction: Checklist and/or registers to be completed regularly by competent staff. All generators to be maintained and/or repaired. Required PPE to be used. Drip trays to be used to prevent spillages.
80.	Welders / Flame cutters	Electricity, Welding/cutting fumes and gasses . Excessive heat. UV and IR radiation	Electric shock, Inhalation of fumes and gasses. Burns. Fires. Explosions	Health and Safety	Y	N	6	6	3	108	H	Construction: Checklist and/or registers to be completed regularly by competent staff. All welding machines and flame cutting machines to be maintained and/or repaired. Required PPE to be used. Drip trays to be used to prevent spillages.
81.	Concrete Mixers	Moving parts, cement , cement dust. Noise	Inhalation of dust. Concrete splashes in the eyes. NIHL . Personal injuries.	Health and Safety	Y	N	3	6	4	72	M	Construction: Checklist and/or registers to be completed regularly by competent staff. All concrete mixers to be maintained and/or repaired. Required PPE to be used.
82.	Compressed Air Tools (Pressurised Equipment)	Excessive noise, compressed air injury (pepper wounds). Dust and Air pollution. Flushing using hoses. Hose bursts (snaking).	Personal Injuries, eye injuries, noise induced hearing loss.	Safety	Y	N	6	2	5	60	M	Construction: No compressed air to be directed to person. Equipment registers to be maintained. Equipment / hose links secured with safety slings. Minimise dust liberation when using compressed air. Use required PPE when working with compressed air.
83.	Hammer breakers	Noise, Vibration, crystalline silica. Dust, fumes & airborne material. Heat. Electricity	Breaking, drilling, hammering, or other activities involving rock, concrete, asphalt or other materials may cause silicosis. Vibration may cause, contribute to, or aggravate injury or disorders to the operator's fingers, hands, wrists, arms, shoulders and/or other body parts. Noise Induced hearing loss.	Health and Safety	Y	A	6	3	4	72	M	Construction: Inspect chisels and breakers. Always disconnect the electric power or air supply before inserting or removing tools. Be sure all tools are properly locked into the unit before operating. Keep all bystanders out of the work area. Prevent back injuries by using your leg muscles to lift the machine into operating position. Allow the tool to do the work by using a grip light enough to maintain control. Take rest breaks as needed. If stopping work for a short period of time or for the day, unplug the electricity or stop the compressor.

PROCESS												
84.	Design	Not complying with SANS Standards, not taking H&S specification into consideration, not providing client with pre-tender report, not notifying client of construction H&S hazards and mitigation thereof, including hazardous processes and materials in the design, not including maintenance considerations in the design, not doing inspections mandated by the client, not taking ergonomics into consideration during design	Not detecting hazards during design, not complying with specification, H&S costs not reaching contractor/s, Geotech aspects not considered, injury to workers and damage to property, hazardous materials causing injury, diseases, fire or property damage, causing unsafe maintenance during operation stage, unsafe conditions during construction not rectified, ergonomic disease during construction and operations stages.	Health and Safety	Y	N	3	6	5	90	M	Construction: Stop contractors doing unsafe work and point out work not done according to the design. Inspect construction work as per client's request. Manage changes in design and additional work requested by the client.
85.	Clearing and grubbing, vegetation clearance.	Moving machinery, Dangerous snakes	Personal Injuries. Vehicle accidents, bitten by dangerous snakes.	Safety	Y	A	6	6	4	144	H	Construction: Implement traffic management plan. Inspect all vehicles and mobile plant before use. Inspection registers to be signed by the operator and driven machinery supervisor. Flagman to control traffic to and from site entering public roads. Required PPE to be used. Regular maintenance on mobile plant and lifting equipment. Use drip trays to prevent pollution. Practice dust allaying where relevant. Demarcate roadways and separate walkways. Control vehicle speed. Inspect area for dangerous snakes. Use snake handling equipment to catch, secure, transport and release snakes.
86.	Excavations	Unstable soil condition, not battered sides of excavation, not shored/ braced, placing load on excavation edge, mobile plant movement, not inspecting excavation condition, not barricading edges. Ground water seeping through excavations.	Collapse of excavation, inundation of excavations, mobile plant falling into excavation. Property damage. Fatal injury to person/s. persons falling into excavation causing injury	Safety	Y	A	10	6	5	300	VHR	Construction: DSTI to be completed and communicated with employees. All excavations to be inspected and declared safe by a competent person. Excavation inspection checklist to be used and completed by a competent person. Ladders used for access to be used not exceeding 6 meters from area where employees are working. Regular inspections to be conducted by the geotechnical professionals on stability of ground conditions. No plant, equipment or material to move or to be stored/stacked on the edges of any excavation. Trenches deeper than 1.5 meters should be shored and braced particularly if they will be kept open for extended periods.
87.	Bedding & Backfilling	Placing load on excavation edge, mobile plant movement. Employees compacting material. Vibration, noise, dust	Collapse of excavation sidewalls, mobile plant falling into excavation. Property damage. Inhalation of dust, NIHL.	Health and Safety	Y	A	6	6	5	180	H	Construction : No material to be stored on the edges of excavations. Driven machinery used to put material in excavated areas to comply with safe distances from the edges of excavations to prevent possible collapse of sidewalls. Employees to use the correct PPE. Regular checklists to be completed for compactors and hand tools.

88.	Lifting operations	Base unstable, unsafe erecting, unsafe operation, crane boom radius not known, operator untrained, working under suspended load, unsafe rigging practices, damaged slings	Crane collapse. Crane boom fall. Crane boom damaging property. Falling loads. Workers on site not moving out of slew path. Load falling due to poor rigging. Sling breaking under load causing load falling and injuring persons.		Y	A	6	6	5	180	H	Construction: DSTI to be conducted and communicated with employees. All lifting activities to be controlled by competent riggers. Areas where lifting activities are taking place to be barricaded. Access to be restricted. No employees to work/walk under suspended loads. Crane operator and rigger to use two way radio for communication. Two assistants used on both sides of the 12 meter pipes with guide ropes to prevent swinging of pipes.
89.	Welding & Flame cutting	Electricity, Welding/cutting fumes and gasses. Excessive heat. UV and IR radiation	Electric shock, Inhalation of fumes and gasses. Burnes. Fires. Explosions	Health and Safety	Y	A	3	6	4	72	M	Construction: DSTI to be conducted and communicated with employees. Employees to inspect welding machines or flame cutting machines before use. Defects to be reported immediately. Access to be restricted to welding and flame cutting areas. Screens to be used, signs to be displayed. Fire extinguishers to be available.
90.	Grinding	Electrical shock. Cracked grinding disc. Wrong cutting /grinding dis. Unsafe cables. Unsafe operating practice. Defective grinding machine. Noise. Sparks	Noise. Cuts bruise, Amputations of limbs/ body parts. Equipment failure. Electrical shocks, Flying pieces causing severe injuries. Burns		Y	A	3	6	4	72	M	Construction: Checklist and/or registers to be completed regularly by competent staff. All grinders to be maintained and/or repaired. Required PPE to be used. Comply with relevant regulation requirements. Access to be restricted to grinding areas. Screens to be used, signs to be displayed. Fire extinguishers to be available.
91.	Steel fixing	Sharp edges, sharp points, off cuts, wire cuts	Injuries, cuts and bruises, eye injuries, pollution		Y	A	6	6	2	72	M	Construction: Tie reinforcing steel according to drawings. Use correct PPE when tying steel. Clean steel tying area at least daily and place off-cuts in provided skip
92.	Working at Fall Risk Positions	Unsafe installation. Incompetent installers, inspectors. Unsafe design. Incompetent users. Unsafe behaviour. Failure of equipment, and material. Not using PPE (Safety harness).	Falling to lower elevation, temporary structure collapsing/falling over, falling onto. Falling through. Falling down.	Safety	Y	A	6	6	5	180	H	Construction: Fall protection plan to be implemented. Fall arrest equipment to be issued to employees. Fall arrest equipment to be inspected. Inspection registers to be completed.
93.	Scaffolding material	Inadequate scaffold material, Incompetent erectors and inspectors. Unsafe scaffolding	Scaffolding can collapse. Employees falling from scaffolding.		Y	A	6	6	5	180	H	Construction: Scaffolding work to be supervised by a competent scaffold supervisor. Scaffolding to be constructed according to SANS 10085. Scaffolding to be inspected and declared safe before use. Green tag or red tag to be displayed. Scaffolding to be regularly inspected.
94.	Tie-in: to existing services	Tie-in done by incompetent person/s. Damage to existing services. Damage done to Vrede WWTW plant installations. Tie in when upgraded portions of plant are still in operation.	Injury to person/s. Extensive damage to equipment and property / personal injuries, damages to existing structures or equipment.	Safety	Y	A	6	6	5	180	H	Construction: Liaise with the Vrede WWTW control room to ensure lockout where applicable is done. Ensure, where applicable lockout is functional. Competent person/s supervise tie-in. Do tests to ensure tie-in is correctly completed. Remove lockout.

95.	Electrical and Mechanical works.	Electricity	Electrical shocks, Severe injuries (burns).	Safety	Y	N	6	6	5	180	H	Construction: Liaise with the WWTW control room to ensure that lockout where applicable is done. Ensure, where applicable lockout is functional. Competent person/s supervise electrical and mechanical works. Do tests to ensure electrical and mechanical works is correctly completed. Remove lockout.
96.	Working in Confined spaces	Oxygen Deficiency. Oxygen Enrichment. Excessive Heat. Toxic Atmosphere. Flowing Liquid	loss of consciousness, injury or death from contaminants in the air. Suffocation from oxygen deficiency.	Safety	Y	A	10	6	5	300	VHR	Construction. Liaise with the Vrede WWTW control room to ensure that lockout where applicable is done DSTI to be conducted . Contractor to comply with all the requirements specified in the GSR 5.
97.	Improve access roads	Asphalt, excessive heat, mobile plant	Throat and eye irritation, Fatigue, cough, and skin cancer. Struck by driven machinery. Vehicle accidents. Personal injuries.	Health and Safety	Y	A	6	6	5	180	H	Construction: All plant and mobile machinery to be inspected before use. Access to the construction area to completely be restricted. Traffic signage to be displayed. Flag personal to regulate traffic.
98.	Improvements of existing services	Saw cut, break out, treat exposed concrete face and exposed reinforcing . Construct new tension beams	Damages to existing structures. Collapse of existing structures . Severe injuries .personal injuries	Safety	Y	A	6	6	4	144	H	Construction. Liaise with the Vrede WWTW control room to ensure that lockout where applicable is done. Ensure, where applicable lockout is functional. Competent person/s supervise tie-in. Do tests to ensure tie-in is correctly completed. Remove lockout. Inspect all tools and equipment. Employees to use the correct PPE.
99.	Wet trades	Wet concrete, repetitive movements, cement dust, hazardous chemical, polluting environment. Heavy lifting, lifting to higher level.	Inhalation of cement, silicosis, dermatitis. Muscle strain. Environmental pollution.	Safety , Health and Environment	Y	A	3	6	3	54	M	Construction: Correct PPE worn. Rest periods/ person rotation. Trained persons to use power floats. Inspect and complete the checklist.
MATERIAL												
100.	In Sutu material	Placing load on excavation edge, mobile plant movement. Employees compacting material. Vibration, noise, dust	Collapse of excavation sidewalls ,mobile plant falling into excavation. Property damage. Inhalation of dust, NIHL.	Health and Safety	Y	A	6	6	5	180	H	Construction : No material to be stored on the edges of excavations. Driven machinery used to put material in excavated areas to comply with safe distances from the edges of excavations to prevent possible collapse of sidewalls. Employees to use the correct PPE. Regular checklists to be completed for compactors and hand tools.
101.	Grinding discs	Cracked grinding disc. Wrong cutting /grinding dis.	Discs can break resulting into flying pieces.	Safety	Y	A	6	6	4	144	H	Construction: Checklist and/or registers to be completed regularly by competent staff. All grinding discs to be maintained and/or repaired. Required PPE to be used. Comply with relevant regulation requirements. Access to be restricted to grinding areas. Screens to be used, signs to be displayed. Fire extinguishers to be available.
102.	Interconnecting pipe work.	Improper stacking of pipes . Improper lifting . Improper handling	Personal injuries. Damages	Safety and Health	Y	A	6	6	5	180	H	Construction: Stack material properly. No stacking allowed outside the planned laydown area. Control delivery and off-loading. Follow manual handling safety rules.

103.	Concrete	Wet concrete, repetitive movements, cement dust, hazardous chemical.	Inhalation of cement dust, silicosis, dermatitis.	Safety , Health and Environment	Y	A	3	6	3	54	M	Construction: Concrete trucks to follow Traffic Management plan. Concrete trucks to maintain safe distance from the edges of excavations. Employees to wear the correct PPE.
104.	Signage	Emergency, directive, fire equipment position signage not displayed	Chaotic conditions existing in emergency situations	Safety	Y	A	6	3	3	54	M	Construction: Identify and display signage in positions where required. Maintain signage in good condition. Remove signage when no longer required.
105.	Reinforcing steel	Sharp edges, sharp points, off cuts, wire cuts	Injuries, cuts and bruises, eye injuries, pollution	Safety	Y	A	6	6	2	72	M	Construction: Tie reinforcing steel according to drawings. Use correct PPE when tying steel. Clean steel tying area at least daily and place off-cuts in provided skip
106.	Chlorine & Chlorine storage tanks	Highly corrosive in moist conditions. Strong oxidiser. Chlorine fumes.	Irritating throat, skin and eyes. Cause chest pains. Higher levels can burn lungs and cause fluids in the lungs. Contact can severely burn eyes and skin. Not flammable but strong oxidiser and will support burning of combustible material.	Health and Safety	Y	A	6	3	4	72	M	Construction: Chlorine containers to be properly handled. Store in well ventilated areas. Do not drag, roll or slide cylinders. Protect cylinders from physical damages . Keep containers tightly closed. Employees to use the correct PPE. Chlorine emergency equipment to be close to where chlorine is handled.
107.	Bricks	Rough brick surfaces, unnatural postures, repetitive movements, poor stacking.	Twisting and straining of back muscles. Hand injuries. Stack collapse on top of worker.	Safety	Y	N	6	3	3	54	M	Construction: Use required PPE when working with bricks. Keep bricks properly stacked. Use forklifts where possible to transport and lift bricks.
108.	Removing asbestos material	Exposure to airborne concentrations of asbestos dust and fibres.	Exposure to airborne concentrations of asbestos dust and fibres can cause Asbestosis, Lung Cancer and Mesothelioma.	Health	Y	N	6	3	4	72	M	Construction: Conduct air monitoring, medical surveillance. Supervise the cleaning up and disposal of any material containing asbestos
109.	Reinforced concrete & Steel grating walkways.	Hand tools used incorrectly. Exposure to hazardous materials, dust and toxic vapours. Slip, trip and fall hazards. Not using correct PPE. Incorrect lifting techniques.	Hand injuries. Injuries to persons. Occupational disease, back injuries. Employees falling from structures.	Safety	Y	N	3	3	4	36	L	Construction: Supervisor to ensure the correct tools are used for the task. Use hazardous chemicals according the MSDS. Keep work area clear of slip and trip hazards.
ENVIRONMENT/ CONDITIONS and HYGIENE												
110.	Site Facilities	Sleeping on site, Ablution, sanitation, Changing and washing facilities inadequate. Eating and Resting areas.	Non-Conformance to Legal Requirements as per Construction and Facilities Regulations. Eating on-site (diseases site contamination/ pollution).	Health and Safety	Y	N	3	6	3	54	M	Construction: Toilets, ablutions, changing and washing facilities at site establishment. NO Sleeping on-site. Establish designated Eating/ resting areas with waste management.
111.	Occupational Hygiene	Occupational Hygiene stressors, Loss of production, Diseases, contamination,	Diseases, Occupational Hygiene, Medical Surveillance, Toxicology/ Hazardous Chemicals, Biological Stress, Noise Induced Hearing Loss, Radiation.	Health and Safety	Y	N	6	6	3	108	H	Construction: Medical Surveillance Systems, AIA Assessments and Control measures, Hazardous Chemical stacking, storage and monitoring, Noise Induced Hearing Loss control measures, Soil Compacting Testing equipment controls (i.e. Troxler's).
112.	Hazardous Chemicals	Flammable, Pollution, Explosion, Toxic,	Fire, Explosion, Toxic, Diseases, Environmental Pollution,	Health and Safety	Y	N	3	6	3	54	M	Construction: Hazardous Chemical Controls (Engineering and Admin). Waste Management.
113.	Climate	Adverse/ Abnormal rainfall, Heat stress, Cold stress,	Flooding, Heat stress, Cold Stress, Loss of production,	Health and Safety	Y	N	6	6	3	108	H	Construction: No work allowed during inclement weather (specific scaffolds and excavation). Sufficient, suitable Personal Protective Equipment (clothing). Safe to use potable /drinking water available.

114.	Housekeeping, stacking, storage	Un-levelled laydown areas, unsafe height/width ratio, laydown/rubble areas not demarcated, unsafe stacking/tools at work area, tripping hazard, unsafe Hazchem storage, unsafe storage of flammable material	Damage to equipment/material/property, personal injury too workers/public, fire	Health and Safety	Y	N	6	6	5	180	H	Construction: Stacking and storage regulations to be implemented & monitored. Rubble removal to be done regularly, removal to a registered dump site (Env. Man. Plan) (EIA, Record of Decision). Chemical / facilities / store areas to be separated and in one area (as far as reasonable practicable). Inspect works area before works commence, DSTI'S and PTO to be completed.
115.	Access and Egress Routes to/ from site	Inadequate, Unidentified. Public. Pedestrians.	Collisions. Loss of production. Pollution. Public Liability (claims).	Health and Safety	Y	N	6	6	5	180	H	Construction: Traffic. Accommodation. Temporary signage. Public Awareness. (Comment: Limit long vehicles for delivery to site).
116.	Perimeter fencing and hoarding.	Theft, Vandalism, loss of production, Unauthorised persons enter site.	Theft, Loss of Production, damage, arson, Injury to public,	Health and Safety	Y	N	6	6	5	180	H	Construction: Erect sound fencing/ hoarding and manage access control / security. Security controls during night and long periods of absence (week-ends, holidays etc.).
117.	Site Topography (Slope)	Run-away vehicles, slipping and falling ,	Damage to equipment/material/property, personal injury too workers/public,	Health and Safety	Y	N	3	6	3	54	M	Construction: Chock vehicles wheels when parked and apply hand brake. Traffic Management. Level walkways as far as possible.
118.	Emergency and Evacuation	No plan, no alarm, escape way not demarcated, no assembly point, no first aid equipment, no firefighting equipment, no trained fire fighters.	Injury, burns, persons unable to escape, persons not knowing where to assemble (chaos), injured not treated, fire not extinguished (in case the emergency is a fire), nobody able to extinguish a fire.	Health and Safety	Y	N	6	6	5	180	H	Construction: Provide an alarm on site. Demarcate the escape route. Demarcate the assembly point position. Provide first aid and firefighting equipment on site. Do evacuation drills.
119.	Leaking sewage / effluent	Working with or in leaking sewage / effluent.	Diarrhea, fever, cramps, and sometimes vomiting, headache, weakness, or loss of appetite	Health	Y	A	6	6	4	144	H	Construction: Monitor exposure to leaking sewage / effluent. Conduct medical surveillance on employees working with leaking sewage and effluent. Keep record of all assessments, monitoring results and medical surveillance reports. Inspect personal protective equipment.
120.	Dangerous animals	Dangerous snakes and bees	People getting bitten by snakes or stung by bees.	Safety	Y	A	6	6	5	180	H	Construction: Inspect area for dangerous snakes. Use snake handling equipment to catch, secure, transport and releasing of snakes. Report any dangerous animals to WWTW water.
FINANCIAL												
121.	Cost for H&S requirements	No funds for: formal and informal training, PPE, stationary, printing, notice boards, signage, first aid equipment, firefighting equipment, facilities, lifting tackle certification, medical surveillance, load testing, COC temporary electricity.	Lack of the following on the project: formal and informal training, PPE, stationary, printing, notice boards, signage, first aid equipment, firefighting equipment, facilities, lifting tackle certification, medical surveillance, load testing, COC temporary electricity.	Safety, Health and Environment	Y	N	6	6	4	144	H	Construction: Provide funding for: formal and informal training, PPE, stationary, printing, notice boards, signage, first aid equipment, firefighting equipment, facilities, lifting tackle certification, medical surveillance, load testing, COC temporary electricity.
LEGAL												
122.	Legal Framework for Project	Not complying with legislation, regulations and standards	Court cases against project, fines, imprisonment	Safety, Health and Environment	Y	N	6	10	5	300	VHR	Construction: Apply the legal framework of all Acts, regulations and standards that have effect on the project to the work and administration of the project
POST CONSTRUCTION												
PEOPLE												
123.	Designer procurement and services	Incompetent, not registered with professional body, inadequate resources,	Inadequate design. Registration invalid. Cannot complete project.	Health and Safety	Y	N	3	6	5	90	M	Post construction: Do final inspections and sign off final completion certificates.

124.	Consultants and specialists procurement and services	Incompetent, not registered with professional body, inadequate resources,	Inadequate consultant/ specialist services. Registration no longer valid. Cannot see project to completion.	Health and Safety	Y	N	3	6	5	90	M	Post-construction: Do final inspection. Obtain COC for the installation/s satisfying standard.
125.	Principal contractor procurement and services	Incompetent, no letter of good standing, no adequate resources, not provided for cost of H&S measures, no safety plan, no safety file, safety plan not approved,	Construction work of inferior quality (even collapse thereof). Injured workers not receiving proper medical care. Construction project not completed. Incidents accidents and property damage due to lack of funds or equipment. Breach of laws/ regulations, no H&S commitment, no safety system to eliminate/ mitigate unsafe acts or conditions.	Health and Safety	Y	N	6	10	5	300	VHR	Post-construction: Hand over a consolidated H&S file to the client. Provide client with O&M manuals. Provide client with warranties. Provide/ organise training on safety and operational aspects of installed plant/ installations.
126.	Competency	Incompetent	Non- Compliance to Legal Requirements. Personal Injury. Public Liability. Unskilled/ untrained. Not informed.	Health and Safety	Y	N	6	10	5	300	VHR	Post-construction: Collate training records and hand to client.
127.	Legal Authority, Roles and Responsibilities and Accountabilities	Major non-conformance to Legal Requirements	Non- Compliance to Legal Requirements. Personal Injury. Public Liability. Unskilled/ untrained. Not informed.	Health and Safety	Y	N	6	6	5	180	H	Post-construction: Cancel appointments.
128.	Incapability	Not medical fit as per Legal Requirements	Incapability. Not fit for work (medical and Psychological)	Health and Safety	Y	N	3	6	5	90	M	Post construction: Have exit medical examinations completed.,
129.	Compulsory community labour use	Disputes, rioting, picketing, arson, vandalism.	Non- Compliance with Legal Requirements. Personal Injury. Public Liability. Unskilled/ untrained. Not informed.	Health and Safety	Y	N	6	3	4	72	M	Post-construction: Close-out meeting with community leaders. Termination of contracts.
EQUIPMENT												
130.	Equipment Transport to site. Delivery and Off-loading.	Road accidents, off-loading accidents	Loss of material/ equipment. Personal injury, damage to vehicles. Public Liability insurance. Under influence of intoxicating substances	Safety	Y	N	6	6	5	180	H	Post-construction: Add vehicle checks, licence of driver, and other accumulated documents to client as part of the consolidated file
131.	Stacking and Storage	Un-levelled laydown areas, unsafe height/ width ratio, laydown/ rubble areas not demarcated, unsafe stacking/ tools at work area, tripping hazard, unsafe Hazchem storage, unsafe storage of flammable material	Damage to equipment/ material/ property. Personal injury to workers/public, fire	Safety	Y	N	6	3	3	54	M	Post-construction: Remove all unused materials from site. Clean laydown area. Removed barricading.
132.	Construction Vehicles	Unauthorised operators, operators not trained, vehicles not suitable for the job, vehicles not road worthy, vehicles on site not accompanied by flagmen. No reverse alarms, defective rotate lights.	Vehicle accidents, vehicles falling into excavated areas , vehicles hitting employees on site, noise, pollution	Safety	Y	N	3	6	5	90	M	Post-construction: Clean roads, remove vehicle signage, include checklists in consolidated file.
133.	Lifting Machines	Defective lifting machines .Lifting machines not load tested ,Incompetent operator.	Loads can fall, Cranes can fall over causing severe injuries and damaged.	Safety	Y	N	3	6	5	90	M	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
134.	Lifting Equipment	Defective lifting equipment. Lifting equipment not load tested. Using insufficient lifting equipment.	Lifting equipment can fail, loads can fall and cause severe injuries and damage.	Safety	Y	N	6	6	5	180	H	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
135.	Use of operate hand tools	Cuts bruise, Amputations of limbs/ body parts. Equipment failure. Cracked and chipped (mushroomed) tools, Unsafe operating practice. Wrong, Incorrect tools for task used.	Injuries, noise induced hearing loss, respiratory problems (Silicosis in lungs). Ergonomic injury.	Safety	Y	N	3	6	3	54	M	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.

136.	Use and operate portable electrical equipment	Hand Arm vibration. Noise. Cuts bruise, Amputations of limbs/ body parts. Equipment failure. Electrical shock. Cracked housing. Unsafe cables. Unsafe operating practice.	Electrical shocks, Severe injuries, noise induced hearing loss, respiratory problems (Silicosis in lungs). Ergonomic injury. Environmental pollution	Health and Safety	Y	N	3	6	3	54	M	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
137.	Use of ladders	Defective ladders. Incorrect use of ladders. Improper storage of ladders.	Ladders can break, causing employees to fall from ladders. Ladders can fall over causing employees to fall to ground. Employees can fall from ladders.	Safety	Y	N	3	6	3	54	M	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
138.	Generators	Noise, Leaking fuel, Hot engine	NIHL, Burns, fire, electric shock. Slipping on spilled fuel.	Health and Safety	Y	N	3	6	3	54	M	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
139.	Welders / Flame cutters	Electricity, Welding/cutting fumes and gasses, Excessive heat. UV and IR radiation	Electric shock, Inhalation of fumes and gasses. Burns. Fires. Explosions	Health and Safety	Y	N	6	6	3	108	H	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
140.	Concrete Mixers	Moving parts, cement, cement dust. Noise	Inhalation of dust. Concrete splashes in the eyes. NIHL. Personal injuries.	Health and Safety	Y	N	3	6	4	72	M	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
141.	Compressed Air Tools (Pressurised Equipment)	Excessive noise, compressed air injury (pepper wounds). Dust and Air pollution. Flushing using hoses. Hose bursts (snaking).	Personal Injuries, eye injuries, noise induced hearing loss.	Safety	Y	N	6	2	5	60	M	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
142.	Hammer breakers	Noise, Vibration, crystalline silica. Dust, fumes & airborne material. Heat. Electricity	Breaking, drilling, hammering, or other activities involving rock, concrete, asphalt or other materials may cause silicosis. Vibration may cause, contribute to, or aggravate injury or disorders to the operator's fingers, hands, wrists, arms, shoulders and/or other body parts. Noise Induced hearing loss.	Health and Safety	Y	A	6	3	4	72	M	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
PROCESS												
143.	Design	Not complying with SANS Standards, not taking H&S specification into consideration, not providing client with pre-tender report, not notifying client of construction H&S hazards and mitigation thereof, including hazardous processes and materials in the design, not including maintenance considerations in the design, not doing inspections mandated by the client, not taking ergonomics into consideration during design	Not detecting hazards during design, not complying with specification, H&S costs not reaching contractor/s, Geotech aspects not considered, injury to workers and damage to property, hazardous materials causing injury, diseases, fire or property damage, causing unsafe maintenance during operation stage, unsafe conditions during construction not rectified, ergonomic disease during construction and operations stages.	Health and Safety	Y	N	3	6	5	90	M	Post-construction: Do final inspections and sign completion certificates. Obtain O&M manuals. Obtain warranties.
144.	Clearing and grubbing, vegetation clearance.	Moving machinery, Dangerous snakes	Personal Injuries. Vehicle accidents, bitten by dangerous snakes.	Safety	Y	A	6	6	4	144	H	Post-construction: Rehabilitate area

145.	Excavations	Unstable soil condition, not battered sides of excavation, not shored/ braced, placing load on excavation edge, mobile plant movement, not inspecting excavation condition, not barricading edges. Ground water seeping through excavations.	Collapse of excavation, inundation of excavations, mobile plant falling into excavation. Property damage. Fatal injury to person/s. persons falling into excavation causing injury	Safety	Y	A	10	6	5	300	VHR	Post-construction: Method statement, risk assessment, safe operating procedures and all registers and checklists incorporated in the consolidated safety file and handed to the client.
146.	Bedding & Backfilling	Placing load on excavation edge, mobile plant movement. Employees compacting material. Vibration, noise, dust	Collapse of excavation sidewalls ,mobile plant falling into excavation. Property damage. Inhalation of dust, NIHL.	Health and Safety	Y	A	6	6	5	180	H	Post-construction: Remove all unused materials from site. Clean laydown area. Removed barricading.
147.	Lifting operations	Base unstable, unsafe erecting, unsafe operation, crane boom radius not known, operator untrained, working under suspended load, unsafe rigging practices, damaged slings	Crane collapse. Crane boom fall. Crane boom damaging property. Falling loads. Workers on site not moving out of slew path. Load falling due to poor rigging. Sling breaking under load causing load falling and injuring persons.		Y	A	6	6	5	180	H	Post-construction: Method statement, risk assessment, safe operating procedures and all registers and checklists incorporated in the consolidated safety file and handed to the client.
148.	Welding & Flame cutting	Electricity, Welding/cutting fumes and gasses . Excessive heat. UV and IR radiation	Electric shock, Inhalation of fumes and gasses. Burnes. Fires. Explosions	Health and Safety	Y	A	3	6	4	72	M	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
149.	Grinding	Electrical shock. Cracked grinding disc. Wrong cutting /grinding dis. Unsafe cables. Unsafe operating practice. Defective grinding machine . Noise. Sparks	Noise. Cuts bruise, Amputations of limbs/ body parts. Equipment failure. Electrical shocks, Flying pieces causing severe injuries. Burns		Y	A	3	6	4	72	M	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
150.	Cathodic protection	Working in excavated areas.	Collapse of sidewalls.	Safety	Y	A	3	6	4	72	M	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
151.	Steel fixing	Sharp edges, sharp points, off cuts, wire cuts	Injuries, cuts and bruises, eye injuries, pollution		Y	A	6	6	2	72	M	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
152.	Working at Fall Risk Positions	Unsafe installation. Incompetent installers, inspectors. Unsafe design. Incompetent users. Unsafe behaviour. Failure of equipment, and material. Not using PPE (Safety harness).	Falling to lower elevation, temporary structure collapsing/falling over, falling onto. Falling through. Falling down.	Safety	Y	A	6	6	5	180	H	Post-construction: Fall protection plan and fall protection risk assessment and registers added to the consolidated file.
153.	Scaffolding material	Inadequate scaffold material, Incompetent erectors and inspectors . Unsafe scaffolding	Scaffolding can collapse. Employees falling from scaffolding.		Y	A	6	6	5	180	H	Post-construction: All registers and checklists incorporated in the consolidated safety file and handed to the client.
154.	Tie-in: to existing services	Tie-in done by incompetent person/s. Damage to existing services. Damage done to Vrede WWTW plant installations. Tie in when upgraded portions of plant are still in operation.	Injury to person/s. Extensive damage to equipment and property / personal injuries, damages to existing structures or equipment.	Safety	Y	A	6	6	5	180	H	Post-construction: Cancel permits, remove lock outs. Do final inspections and sign completion certificates. Obtain O&M manuals. Obtain warranties.
155.	Electrical and Mechanical works.	Electricity	Electrical shocks, Severe injuries (burns).	Safety	Y	N	6	6	5	180	H	Post-construction: Cancel permits, remove lock outs. Do final inspections and sign completion certificates. Obtain O&M manuals. Obtain warranties.
156.	Working in Confined spaces	Oxygen Deficiency. Oxygen Enrichment. Excessive Heat. Toxic Atmosphere. Flowing Liquid	loss of consciousness, injury or death from contaminants in the air. Suffocation from oxygen deficiency.	Safety	Y	A	10	6	5	300	VHR	Post-construction: Cancel permits, remove lock outs. Do final inspections and sign completion certificates. Obtain O&M manuals. Obtain warranties.

157.	Improve access roads	Asphalt, excessive heat, mobile plant	Throat and eye irritation, Fatigue, cough, and skin cancer. Struck by driven machinery. Vehicle accidents. Personal injuries.	Health and Safety	Y	A	6	6	5	180	H	Post-construction: Method statements, risk assessments and SWP to be placed in consolidated safety file. All registers and checklists incorporated in the consolidated safety file and handed to the client.
158.	Improvements of existing services	Saw cut, break out, treat exposed concrete face and exposed reinforcing . Construct new tension beams	Damages to existing structures. Collapse of existing structures . Severe injuries .personal injuries	Safety	Y	A	6	6	4	144	H	Post-construction: Method statements, risk assessments and SWP to be placed in consolidated safety file. All registers and checklists incorporated in the consolidated safety file and handed to the client.
159.	Wet trades	Wet concrete, repetitive movements, cement dust, hazardous chemical, polluting environment. Heavy lifting, lifting to higher level.	Inhalation of cement, silicosis, dermatitis. Muscle strain. Environmental pollution.	Safety , Health and Environment	Y	A	3	6	3	54	M	Post-construction: Include the checklist in the consolidated file
MATERIAL												

160.	In Sutu material	Placing load on excavation edge, mobile plant movement. Employees compacting material. Vibration, noise, dust	Collapse of excavation sidewalls ,mobile plant falling into excavation. Property damage. Inhalation of dust, NIHL.	Health and Safety	Y	A	6	6	5	180	H	Post-construction: Remove all unused materials from site. Clean laydown area. Removed barricading.
161.	Interconnecting pipe work.	Improper stacking of pipes . Improper lifting . Improper handling	Personal injuries. Damages	Safety and Health	Y	A	6	6	5	180	H	Post-construction: Remove all unused materials from site. Clean laydown area. Removed barricading.
162.	Concrete	Wet concrete, repetitive movements, cement dust, hazardous chemical.	Inhalation of cement dust, silicosis, dermatitis.	Safety , Health and Environment	Y	A	3	6	3	54	M	Post-construction: Remove all unused materials from site. Clean laydown area. Removed barricading.
163.	Signage	Emergency, directive, fire equipment position signage not displayed	Chaotic conditions existing in emergency situations	Safety	Y	A	6	3	3	54	M	Post-construction: Remove temporary construction signage.
164.	Reinforcing steel	Sharp edges, sharp points, off cuts, wire cuts	Injuries, cuts and bruises, eye injuries, pollution	Safety	Y	A	6	6	2	72	M	Post-construction: Remove all unused materials from site. Clean laydown area. Removed barricading.
165.	Chlorine & Chlorine storage tanks	Highly corrosive in moist conditions. Strong oxidiser. Chlorine fumes.	Irritating throat, skin and eyes. Cause chest pains. Higher levels can burn lungs and cause fluids in the lungs. Contact can severely burn eyes and skin. Not flammable but strong oxidiser and will support burning of combustible material.	Health and Safety	Y	A	6	3	4	72	M	Post-construction: Do final inspections and sign completion certificates. Obtain O&M manuals. Obtain warranties. All signage to be displayed as specified in the MSDS. Ensure suitable extinguishing media is available like water spray, foam. Do not use carbon dioxide halogenated extinguishing materials. Periodic inspections to be conducted by a competent person to ensure that equipment is used appropriately and that the systems is kept in suitable operating conditions. Regularly inspect and tests piping and containment used of chlorine services. Valves and hoses to be in the correct position before transfer and starting operations
166.	Bricks	Rough brick surfaces, unnatural postures, repetitive movements, poor stacking.	Twisting and straining of back muscles. Hand injuries. Stack collapse on top of worker.	Safety	Y	N	6	3	3	54	M	Post-construction: Remove left-over bricks off site and clean laydown area.
167.	Removing asbestos material	Exposure to airborne concentrations of asbestos dust and fibres.	Exposure to airborne concentrations of asbestos dust and fibres can cause Asbestosis, Lung Cancer and Mesothelioma.	Health	Y	N	6	3	4	72	M	Post-construction: Place records of the results of all assessments, air monitoring, medical surveillance reports and the asbestos inventory required by regulations 7, 8, 9 and 14(1)(b), respectively in a consolidated health and safety file.
168.	Reinforced concrete & Steel grating walkways.	Hand tools used incorrectly. Exposure to hazardous materials, dust and toxic vapours. Slip, trip and fall hazards. Not using correct PPE. Incorrect lifting techniques.	Hand injuries. Injuries to persons. Occupational disease, back injuries. Employees falling from structures.	Safety	Y	N	3	3	4	36	L	Post-construction: Inspect and sign off correct installation and place drawings and schedules on consolidated file.
ENVIRONMENT/ CONDITIONS and HYGIENE												
169.	Site Facilities	Sleeping on site, Ablution, sanitation, Changing and washing facilities inadequate. Eating and Resting areas.	Non-Conformance to Legal Requirements as per Construction and Facilities Regulations. Eating on-site (diseases site contamination/ pollution).	Health and Safety	Y	N	3	6	3	54	M	Post-construction: Remove safely from site: Toilets, ablutions, changing and washing facilities, eating/ resting facilities and clean area.
170.	Occupational Hygiene	Occupational Hygiene stressors, Loss of production, Diseases, contamination,	Diseases, Occupational Hygiene, Medical Surveillance, Toxicology/ Hazardous Chemicals, Biological Stress, Noise Induced Hearing Loss, Radiation.	Health and Safety	Y	N	6	6	3	108	H	Post-construction: Add all documents on the consolidated safety file.

171.	Hazardous Chemicals	Flammable, Pollution, Explosion, Toxic,	Fire, Explosion, Toxic, Diseases, Environmental Pollution,	Health and Safety	Y	N	3	6	3	54	M	Post-construction: Add all documents on the consolidated safety file.
172.	Housekeeping, stacking, storage	Un-levelled laydown areas, unsafe height/width ratio, laydown/rubble areas not demarcated, unsafe stacking/tools at work area, tripping hazard, unsafe Hazchem storage, unsafe storage of flammable material	Damage to equipment/material/property, personal injury too workers/public, fire	Health and Safety	Y	N	6	6	3	108	H	Post-construction: Place waste management plan and other documents on the consolidated file. Clear laydown area.
173.	Access and Egress Routes to/ from site	Inadequate, Unidentified. Public. Pedestrians.	Collisions. Loss of production. Pollution. Public Liability (claims).	Health and Safety	Y	N	6	6	5	180	H	Post-construction: Replace temporary installations with permanent gates and security points.
174.	Perimeter fencing and hoarding.	Theft, Vandalism, loss of production, Unauthorised persons enter site.	Theft, Loss of Production, damage, arson, Injury to public,	Health and Safety	Y	N	6	6	5	180	H	Post-construction: Remove hoarding for permanent perimeter fence/wall.
175.	Emergency and Evacuation	No plan, no alarm, escape way not demarcated, no assembly point, no first aid equipment, no firefighting equipment, no trained fire fighters.	Injury, burns, persons unable to escape, persons not knowing where to assemble (chaos), injured not treated, fire not extinguished (in case the emergency is a fire), nobody able to extinguish a fire.	Health and Safety	Y	N	6	6	5	180	H	Post-construction: Place evacuation drill reports and the emergency plan on consolidated file.
176.	Leaking sewage / effluent	Working with or in leaking sewage / effluent.	Diarrhea, fever, cramps, and sometimes vomiting, headache, weakness, or loss of appetite	Health	Y	A	6	6	4	144	H	Post construction: Put records of all assessments, monitoring result, medical surveillance reports and incident records on consolidated health and safety file.
177.	Dangerous Animals	Dangerous snakes. And bees	People getting bitten by snakes or stung by bees.	Safety	Y	A	6	6	5	180	H	Post-construction: Place incident register in consolidate file.
FINANCIAL												
178.	Cost for H&S requirements	No funds for: formal and informal training, PPE, stationary, printing, notice boards, signage, first aid equipment, firefighting equipment, facilities, lifting tackle certification, medical surveillance, load testing, COC temporary electricity.	Lack of the following on the project: formal and informal training, PPE, stationary, printing, notice boards, signage, first aid equipment, firefighting equipment, facilities, lifting tackle certification, medical surveillance, load testing, COC temporary electricity.	Safety, Health and Environment	Y	N	6	6	4	144	H	Post-construction: Close out budgets and reconcile with expenses for the duration of the project.
LEGAL												
179.	Legal Framework for Project	Not complying with legislation, regulations and standards	Court cases against project, fines, imprisonment	Safety, Health and Environment	Y	N	6	10	5	300	VHR	Post-construction: Close out all legal aspects for the project and comply with legislation that specifically obligated actions to be taken with regard to the closure of the project.