



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

PARTICULARS OF THE BIDDER	
NAME OF THE BIDDING OR TENDERING COMPANY	
POSTAL ADDRESS	POSTAL CODE
STREET ADDRESS (PHYSICAL ADDRESS)	POSTAL CODE
E-MAIL ADDRESS	
TELEPHONE NUMBER (TELKOM LINE)	
CIDB CRS NUMBER	
CELLPHONE NUMBER	
ALTERNATE CELLPHONE NO.	
CENTRAL SUPPLIER DATABASE NUMBER OF THE BIDDING COMPANY	

THE TENDER
Part T1: Tendering procedures

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Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



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DOCUMENT COMPLETION INSTRUCTION AND RETURNABLE DOCUMENTS SCHEDULE

CENTRAL SUPPLIER DATABASE REGISTRATION (CSD)

- ✓ Bidders must be registered on CSD and provide their registration number on the tender/ quotation document

COMPLETION OF THE DOCUMENT

PLEASE READ AND FOLLOW INSTRUCTIONS BELOW ON HOW TO COMPLETE DIFFERENT FORMS IN THE DOCUMENT AND FILL THEM AS INSTRUCTED

- ✓ The tender documents must be completed in full i.e. Compulsory Questionnaire, MBD 1, Pricing Schedule, MBD 4, MBD 5, MBD 6.1, MBD 7.2, MBD 8, MBD 9, Section 38 and the Form of Offer, including all witness signatures on all the above stated forms.
- ✓ ***NB! FAILURE TO ADHERE TO THE BELOW MENTIONED POINTS WILL INVALIDATE THE TENDER AND RESULT IN DISQUALIFICATION***
 - **COMPULSORY QUESTIONNAIRE** must be fully completed and signed
In a case of Joint Venture separate COMPULSORY QUESTIONNAIRE forms must be completed and submitted.
 - **MBD 1** must be fully completed and signed
 - **PRICING SCHEDULE** must be fully completed and signed
 - **MBD 4** -only tick the appropriate answer. Please be informed that whether you scratch out, tick or circle, **your answer will be where the pen ink is reflecting.**
In a case of Joint Venture or multi- directors, full details of all Directors must be provided on the table on MBD 4.
 - **MBD 5** -only tick the appropriate answer. Please be informed that whether you scratch out, tick or circle, **your answer will be where the pen ink is reflecting.**
In a case of Joint Venture separate MBD 5 forms must be completed and submitted.
(complete if applicable)
 - **MBD 6.1** – must be fully completed.
 - **MBD 7.2** must be fully completed.
 - **MBD 8** - only tick the appropriate answer box, whether you scratch out, tick or circle, your answer will be where the pen ink is reflecting
 - **MBD 9** - must be fully completed and signed
 - **SECTION 38** - only tick the appropriate answer box, whether you scratch out, tick or circle, your answer will be where the pen ink is reflecting. Must be fully completed and signed, including signatures of witnesses.

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- Note that should you answer “**NO**” to any of the declaration questions on **section 38 form**, then supporting documents **MUST** be attached
- **SIGNATORY AUTHORISATION** – complete and sign the form
- The document must not be dismantled; page numbers must be sequential

THE FOLLOWING MANDATORY DOCUMENTS MUST BE SUBMITTED TOGETHER WITH THE BID DOCUMENT

- ✓ Deposit slip with tender reference number as stipulated in the tender document.
- ✓ Full CSD report
- **FOR ALL DOCUMENTS THAT WILL NEED CERTIFICATION (AND AFFIDAVITS WHERE APPLICABLE) BIDDERS ARE REQUESTED NOT TO SUBMIT COPIES OF CERTIFIED COPIES.**

MUNICIPAL RATES AND TAXES STATEMENTS OF THE DIRECTORS

- ✓ Current municipal rates and taxes statement (from previous billable month) for each directors’ address must be attached; or
- ✓ Valid lease agreement of the director/s with all critical contractual obligations or,
- ✓ An original letter from tribal authority not older than three (3) months if the director/s are residing in a tribal land, or
- ✓ If the rates and taxes account is not in the names of the director/s the attached municipal rates and taxes statement must be submitted together with an original affidavit from the property owner whose names are appearing on the municipal rates and taxes statement to confirm that the director resides in their property.

MUNICIPAL RATES AND TAXES STATEMENTS OF THE COMPANY

- ✓ Current municipal rates and taxes statement (from previous billable month) for the company’s’ address must be attached; or
- ✓ Valid lease agreement of the company (showing all critical contractual obligations, or
- ✓ An original letter from a tribal authority not older than three (3) months if the company is operating from a tribal, or
- ✓ If the rates and taxes account is not in the names of the company, the attached municipal rates taxes statement must be submitted together with an original affidavit from the property owner whose names are reflecting on the municipal rates and taxes statement to confirm that the company operates from their property.

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NB!!

- ✓ FOR PROCUREMENT EXPECTED TO BE LESS THAN 10 MILLION, AWARDS WILL NOT BE MADE TO BIDDERS OWING MUNICIPAL RATES AND TAXES FOR OVER 90 DAYS AT THE TIME OF TENDER CLOSURE
- ✓ FOR PROCUREMENT EXPECTED TO BE MORE THAN 10 MILLION, AWARDS WILL NOT BE MADE TO BIDDERS OWING MUNICIPAL RATES AND TAXES FOR OVER 30 DAYS AT THE TIME OF TENDER CLOSURE
- ✓ Required CIDB Grading Certificate where applicable
- ✓ Signatory resolution – Please attach a copy of Signatory resolution where instructed
- ✓ If the submission is from a Joint Venture, then a JV agreement must be attached

VERIFICATION OF DOCUMENTS AND INFORMATION.

- ✓ Tax compliance status will be verified using CSD number. (For a bidder to be considered for final award, their status must reflect “tax compliance” before final award is made)
- ✓ CIDB Grading will be verified
- ✓ Sworn Affidavits will be accepted only if its originals submitted.

INSTRUCTION ON THE SUBMISSION OF TENDER DOCUMENTS

- ✓ A tender document must be in a sealed document that has on the outside the bid number and bid description. Both the bid number and the bid description must be on the envelope for the document to be acceptable.
- ✓ If the bid number and description are not clearly marked on the envelope, the bid will be received
- ✓ The tender document must be in the tender box before the specified closing time and date.
- ✓ Bidders who arrive when the tender box is open are late.
- ✓ Failure to comply with the above will lead to the bid not being opened.

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1. Bid documents available at a non-refundable amount of R 3 000-00 per bid document are available on the e-tender website and must be downloaded.
2. A compulsory briefing session will be held as follows: **25 April 2023 from 11H00 @ the Missionary Mpheni House, Rustenburg Local Municipality. Cnr Beyers Naude and Nelson Mandela Drive**
3. Sealed bid documents marked: **"RLM/OMM/0091/2022/23 - Appointment of a contractor for the upgrading of Lethabong Wastewater Treatment Works and installation of sewer reticulation system – phase D"** must be placed in the bid box in the foyer of the Municipal offices, Missionary Mpheni House, Beyers Naude Drive, Rustenburg not later than **19th May 2023 @ 10H00**, where after the bids will be opened in public at the Municipal offices.
4. The bid will be evaluated as follows: **Administrative evaluation (document completion and attachment of mandatory documents), Functionality (minimum qualifying score 70 out of 100), CIDB grading 8CE or higher and 90/10 Preference Point system (price = 90 & Specific goal = 10)**
5. Please note that no bid documents given to couriers will not be signed for by Rustenburg Local Municipality.
6. The Council will not be responsible for bids not received or received late by mail. Bids will remain valid for 90 days (Ninety).
7. All bids will be adjudicated based on the prescribed criterion as stipulated in the document.
8. An updated record of payment of rates, taxes and services to the relevant Municipality must be attached. Failure to do so will invalidate the bid submitted.
9. No bids will be considered from any person(s) in the service of the state (as defined in Regulation 1 of Local Government: Municipal Supply Chain Management Regulations).
10. Objections or complaints must be submitted in writing to the Municipal Manager at the address stated, and must contain the following:
 - (a) reasons and/or grounds for the objection or complaint.
 - (b) the way in which the objector or complainant's rights have been affected; and
 - (c) the remedy sought by the objector or complainant.
11. Any objection or complaint must reach the Municipal Manager with a 14-day period after award has been made. Late objections or complaints will not be entertained.
12. All bids must be submitted on the official forms provided and a successful bidder will be required to fill and sign a written Contract Form (MBD 7).

RUSTENBURG LOCAL MUNICIPALITY, P.O. BOX 16, MISSIONARY MPHENI HOUSE

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T1.1 Tender Notice and Invitation to Tender

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MBD 1

T1.1 Tender Notice and Invitation to Tenders

NB! THE BID DOCUMENTS SHOULD BE RETURNED PACKAGED IN THE MANNER IN WHICH THEY APPEAR IN THE
TABLE OF CONTENTS FOR EASE OF REFERENCE.

PART A INVITATION TO BID

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE RUSTENBURG LOCAL MUNICIPALITY					
BID NUMBER:	RLM/OMM/0091/2022/23	CLOSING DATE:	19 May 2023	CLOSING TIME:	10H00
DESCRIPTION	APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM – PHASE D				

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:

RUSTENBURG LOCAL MUNICIPALITY				
MISSIONARY MPHENI HOUSE				
CNR BEYERS NAUDE AND NELSON MANDELA DRIVE, RUSTENBURG				
CIDB GRADING – 8CE OR HIGHER				
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:

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T1.1
Tender Notice and Invitation to Tenders

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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:		TECHNICAL INFORMATION MAY BE DIRECTED TO:	
DEPARTMENT	SCM	PROJECT MANAGEMENT UNIT	
CONTACT PERSON	Ms.B Manganye	Ms. U Magodla	
TELEPHONE NUMBER	014 590 3198	014 590 3390	
E-MAIL ADDRESS	bmanganye@rustenburg.gov.za	munenceba@rustenburg.gov.za	

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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, COMPLETED WITH A BLACK PEN	
1.3.	THIS BID IS SUBJECT TO THE RLM SUPPLY CHAIN MANAGEMENT POLICY, 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.		

NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE.

SIGNATURE OF BIDDER:

CAPACITY UNDER WHICH THIS BID IS SIGNED:

DATE:

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T1.1
Tender Notice and Invitation to Tenders

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T1.2 Tender Data

The conditions of tender are the Standard Conditions of Tender as contained in Annexure F of the CIDB Standard for Uniformity in Construction Procurement. (See www.cidb.org.za) which are reproduced without amendment or alteration for the convenience of tenderers as an Annexure to this Tender Data.

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

Clause number	Tender Data
F.1.1	The employer The employer is The Rustenburg Local Municipality.
F.1.3.2	Replace the contents of the clause with the following: The Standard Conditions of Tender, the Tender Data, List of Returnable Documents and Returnable Schedules which are required for the tender evaluation purposes, shall form part of the Contract arising from the invitation to tender.
F.2.1	Eligibility Only those tenderers who are registered with the CIDB, or are capable of being so prior to the evaluation of submissions, in a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the sum tendered for a CE class of construction work, are eligible to submit tenders. Joint ventures are eligible to submit tenders provided that: 1. Every member of the joint venture is registered with the CIDB; 2. The lead partner has a contractor grading designation in the 8CE or higher; and the combined contractor grading designation calculated in accordance with the Construction Industry Development Regulations is equal to or higher than a contractor grading designation determined in accordance with the sum tendered for a 8CE or higher class of construction work. Tenderers faced with the above scenario and who fail to meet the combined designation grading will not be considered for the tender.
F.2.1.	Eligibility Only those tenderers who have in their employ management and supervisory staff satisfying the requirements of the scope of work for labour intensive competencies for supervisory and management staff are eligible to submit tenders.
F.2.2	Accept that the Employer will not compensate the tenderer for any costs incurred in attending interviews in the office of the employer.
F.2.7	Clarification Meeting There will not be any briefing session. Should there be any addendum it will be published on either/or of the following websites E-Tender, CIBD and Municipal website.

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T1.2
Tender Data

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**Clause
number**

Tender Data

F.2.10.5

Pricing and tender offer

Add the following to the clause:

A digital copy of the Bill of Quantities can be obtained from Ms. U Magodla Email:
munenceba@rustenburg.gov.za upon sufficient notice.

F.2.11

Alterations to documents

Add the following to the clause:

To correct errors made, draw a line through the incorrect entry and write the correct entry above in black ink and place the full signatures of the authorised signatories next to the correct entry.

F.2.12

Alternative tender offers

If a tenderer wishes to submit an alternative tender offer, the only criteria permitted for such alternative tender offer is that it demonstrably satisfies the Employer's standards and requirements, the details of which may be obtained from the Employer.

Calculations, drawings and all other pertinent technical information and characteristics as well as modified or proposed Pricing Data must be submitted with the alternative tender offer to enable the Employer to evaluate the efficacy of the alternative and its principal elements, to take a view on the degree to which the alternative complies with the Employer's standards and requirements and to evaluate the acceptability of the pricing proposals. Calculations must be set out in a clear and logical sequence and must clearly reflect all design assumptions. Pricing Data must reflect all assumptions in the development of the pricing proposal.

Acceptance of an alternative tender offer will mean acceptance in principle of the offer. It will be an obligation of the contract for the tenderer, in the event that the alternative is accepted, to accept full responsibility and liability that the alternative offer complies in all respects with the Employer's standards and requirements.

The modified Pricing Data must include an amount equal to 5% of the amount tendered for the alternative offer to cover the Employer's costs of confirming the acceptability of the detailed design before it is constructed.

Failure to properly comply with this clause, thereby preventing the Employer and/or the Engineer to properly assess the full implications of the alternative tender, is likely to disqualify the alternative offered from further consideration.

No submission by the Contractor after award for additional payment or time for completion of Works relating to the alternative offer will be considered, the tendered rates submitted shall be considered to reflect the full and final cost implications of the alternative offer.

F.2.13

Submitting a tender offer

Add the following to the clause:

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**Clause
number**

Tender Data

No claim will be entertained for faults in the tender price resulting from any discrepancies, omissions or indistinct figures.

F.2.13.2

Replace the contents of the clause with the following:

Return all volumes of the tender document to the Employer after completion of the relevant sections of each volume in their entirety by writing in black ink.

All volumes are to be left intact in its original format and no pages shall be removed or re-arranged.

F.2.13.3

Parts of each tender offer communicated on paper shall be submitted as an original.

F.2.13.4

Add the following to the clause:

Only authorised signatories may sign the original tender offer where required in terms of 2.13.3.

F.2.13.5

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

F2.15.1

Location of tender box: Foyer of Missionary Mpheni House,
c/o Beyers Naude and Nelson Mandela Drive,
Rustenburg.

Physical address: Missionary Mpheni House,
c/o Beyers Naude and Nelson Mandela Drive,
Rustenburg.

Identification details: BID NO: RLM/OMM/0091/2022/23- APPOINTMENT OF A CONTRACTOR FOR THE
UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER
RETICULATION SYSTEM – PHASE D, and the closing date and time of the tender.

Postal address: P O Box 550, Rustenburg, 0300

The name and address of the tenderer shall be entered on the back of the envelope.

F.2.13.9

Add the following to the clause:

Accept that all conditions, which are printed or written upon any stationary used by the Tenderer for the purpose of or in connection with the submission of a tender offer for this Contract, which are in conflict with the conditions laid down in this document shall be waived, renounced and abandoned.

F.2.14

Information and data to be completed in all respects

Add the following to the clause:

The Tenderer is required to enter information in the following sections of the document:

Section T2.2.....: Returnable Schedules Section

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T1.2
Tender Data

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**Clause
number**

Tender Data

Section C1.1	Form of Offer and Acceptance Section
Section C1.2	Contract Data (Part 2) Section
Section C2.2	Bill of Quantities

The above sections shall be signed by the Tenderer (and witnesses where required). Individual pages should only be initialled by the successful Tenderer and by the witnesses after acceptance by the Employer of the Tender Offer.

The Tenderer shall complete and sign the Form of Offer prior to the submission of a Tender Offer.

The Schedule of Deviations (if applicable) shall be signed by the successful Tenderer after acceptance by the Employer of the Tender Offer.

Accept that the Employer shall in the evaluation of tender offers take due account of the Tenderer's past performance in the execution of similar engineering works of comparable magnitude, and the degree to which he possesses the necessary technical, financial and other resources to enable him to complete the Works successfully within the contract period. Satisfy the Employer and the Engineer as to his ability to perform and complete the Works timeously, safely and with satisfactory quality, and furnish details in section T2.2.2 of contracts of a similar nature and magnitude which they have successfully executed in the past. Accept that the Employer is restricted in accordance with clause 4.(4) of the Construction Regulations 2003, to only appoint a contractor whom he is satisfied has the necessary competencies and resources to carry out the work safely. Accept that submitting inferior and inadequate information relating to health and safety shall be regarded as justifiable and compelling reasons not to accept the Tender Offer of the Tenderer scoring the highest number of tender evaluation points.

F.2.15.1

Closing Time

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

F.2.15.2

Telephonic, telegraphic, telex, facsimile or e-mailed tender offers will not be accepted.

F.2.16.1

Tender offer validity

The tender offer validity period is 90 days.

F.2.16.1

Add the following to the clause:

If the tender validity expires on a Saturday, Sunday or public holiday, the tender shall remain valid and open for acceptance until the closure of business on the following working day.

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number**

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Provide other material

The tenderer shall, when requested by the Employer to do so, submit the names of all management and supervisory staff that will be employed to supervise the labour intensive portion of the works together with satisfactory evidence that such staff members satisfy the eligibility requirements.

Add the following to the clause:

Accept that if requested, the Tenderer shall within 14 days of the date upon which he is requested to do so, submit a full report from his banker as to his financial standing. The Employer may, in its discretion, and subject to the provisions of Section 4(1)(d) of the State Tender Board Act 86 of 1968, condone any failure to comply with the foregoing condition.

F.2.20.

Accept that the Employer, reserves the right to approach the Tenderer's banker or guarantor(s) as indicated in the tender document, or the bankers of each of the individual members of any joint venture that is constituted for purposes of ascertaining the financial strength of the Tenderer or of the individual member of such venture; and affirmation of the letter of intent referred to below.

The tenderer is required to submit with his tender a letter of intent from an approved financial institution undertaking to provide the Construction Guarantee in the format included in Part C1.3 of this procurement document; and such guarantee with be put in place upon appointment.

F.2.22

Return of other tender documents

Return all retained tender documents prior to the closing time for the submission of Tender Offers.

F.2.23

Certificates

The tenderer is required to submit with his tender:

1. a Certificate of Contractor Registration issued by the Construction Industry Development Board
2. a copy of the CSD summary report
3. Copies of legal registration documents of the company/close corporation/partnership including certified copies of identity documents of directors.
4. Bank Rating Letter
5. Documents and Schedules listed in Part T2.

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

F.3.4

Opening of tender submissions

Tenders will be opened immediately after the closing time for tender

F.3.5

Two-envelope system

A two-envelope procedure will not be followed.

F.3.11

Evaluation of Tenders

The procedure for the evaluation of responsive tenders is Method 1 (Functionality, 90/10 Preferential Point System).

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POINTS AWARDED FOR FUNCTIONALITY

The tenderer will be required to achieve a minimum score of **70 points** in the technical evaluation to be considered further in the valuation process.

FUNCTIONALITY

For a bidder to qualify it is a requirement to score a minimum of 70 out of a maximum of 100 points for functionality.

Value: 0 = unmeasurable; Values: 1 = Poor; 3 = Good; 5 = Excellent

ITEM	CRITERIA	WEIGHT	VALUE	SCORE
1	Company Experience – (Attach appointment letters with corresponding completion certificates on Clients letter head with relevant experience Waste Water Treatment Works Projects. Should the bidder be appointed through subcontracting, the maincontractor's appointment, completion certificate and appointment letter of the sub-contracting and completion certificate should be attached). Completed in the past six years (2015-2021)	45		
	R 30 – R40 million (value = 01)			
	R 41 – R50 million projects (value = 03)			
	R 51 million and above (value = 05)			
2	Bank Rating (Attach confirmation letter from the bank)	10		
	R 0 – R 4.3 million (value = 01)			
	R 4.4 million – R 12.9 million (value = 03)			
	R 13 million (value = 05)			
3	Key Personnel Experience - Contracts Manager (Detailed CV with Relevant experience on Sanitation Projects with traceable references with a minimum qualification of BTech/Degree in Mechanical Engineering which is SAQA accredited)	10		
	1-5 years (value = 01)			
	6 - 10 years (value = 03)			
	11 years and above (value = 05)			

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4	Key Personnel Experience - Contracts Manager (Detailed CV with Relevant experience on Sanitation Projects with traceable references with a minimum qualification of BTech/Degree in Civil Engineering which is SAQA accredited)	10		
	1-5 years (value = 01)			
	6 - 10 years (value = 03)			
	11 years and above (value = 05)			
5	Key Personnel Experience - Contracts Manager (Detailed CV with Relevant experience on Sanitation Projects with traceable references with a minimum qualification of BTech/Degree in Electrical Engineering which is SAQA accredited)	10		
	1-5 years (value = 01)			
	6 - 10 years (value = 03)			
	11 years and above (value = 05)			
6	Key Personnel Experience - Site Agent (Detailed CV with Relevant experience on Sanitation Projects with traceable references) Minimum National. Diploma qualification in Civil Engineering] which is SAQA accredited	5		
	1-5 years (value = 01)			
	6 - 10 years (value = 03)			
	11 years and above (value = 05)			
7	Key Personnel Experience - Safety Officer [Experience as a Safety Officer in Sanitation projects. With a minimum Qualification N.Dip or Certified Safety officer] Minimum National Diploma or Certified Safety officer or SAMTRAC which is SAQA accredited	5		
	1-5 years (value = 01)			
	6 - 10 years (value = 03)			
	11 years and above (value = 05)			

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8	NQF Level 5 Accreditation (Manage Labour – Intensive Construction Projects) Any of the above mentioned personnel ContractsManager and Site Agent) – Value 5 Any NQF level less than 5 or no attachment – Value : 0	5		
TOTAL		100		

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EVALUATION ON TENDER PRICE

The following formula will be used to calculate the points for price.

$$Ps = x \left[1 - \frac{Pt - Pmin}{Pmin} \right]$$

where:

Ps = points scored for comparative price of tender under consideration

Pt = comparative price of tender under consideration

Pmin = comparative price of lowest acceptable tender

X = points assigned to price

NB: The lowest acceptable price will be based on the attached market analysis.

The following specific goals will be utilized for awarding of tenders. They can be applicable individually or wholly in awarding of points. The points will be allocated on merit per tender in line with the specification.

Ownership	Points	Means of Verification
Rustenburg Jurisdiction	4	Proof of address as envisaged on the list of mandatory documents and a full Central Supplier Database full report will be used for verification and allocation of points.
Rural /Township Businesses	4	
Black People	2	
Persons with Disability	2	
Youth	4	
Women	2	
SMME's	2	

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Annex: Standard Conditions of Tender

(As contained in Annexure F of the CIDB Standard for Uniformity in Construction Procurement (as amended in Board Notice 86 of 2010 (May 2010))

F.1 General

F.1.1 Actions

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

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

Note: 1) A conflict of interest may arise due to a conflict of roles which might provide an incentive for improper acts in some circumstances. A conflict of interest can create an appearance of impropriety that can undermine confidence in the ability of that person to act properly in his or her position even if no improper acts result.

2) Conflicts of interest in respect of those engaged in the procurement process include direct, indirect or family interests in the tender or outcome of the procurement process and any personal bias, inclination, obligation, allegiance or loyalty which would in any way affect any decisions taken.

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

F.1.2 Tender Documents

The documents issued by the employer for the purpose of a tender offer are listed in the tender data.

F.1.3 Interpretation

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

F.1.3.2 These conditions of tender, the tender data and tender schedules which are only required for tender evaluation purposes, shall not form part of any contract arising from the invitation to tender.

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

- a) **conflict of interest** means any situation in which:
- i) someone in a position of trust has competing professional or personal interests which make it difficult to fulfil his or her duties impartially.
 - ii) an individual or organisation is in a position to exploit a professional or official capacity in some way for their personal or corporate benefit; or

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iii) incompatibility or contradictory interests exist between an employee and the organisation which employs that employee.

- b) **comparative offer** means the tenderer's financial offer after all tendered parameters that will affect the value of the financial offer have been taken into consideration in order to enable comparisons to be made between offers on a comparative basis
- c) **corrupt practice** means the offering, giving, receiving or soliciting of anything of value to influence the action of the employer or his staff or agents in the tender process; and
- d) **fraudulent practice** means the misrepresentation of the facts in order to influence the tender process or the award of a contract arising from a tender offer to the detriment of the employer, including collusive practices intended to establish prices at artificial levels
- e) **organization** means a company, firm, enterprise, association or other legal entity, whether incorporated or not, or a public body
- f) **quality** (functionality) means the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs

F.1.4 Communication and employer's agent

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

F.1.5 The employer's right to accept or reject any tender offer

F.1.5.1 The employer may accept or reject any variation, deviation, tender offer, or alternative tender offer, and may cancel the tender process and reject all tender offers at any time before the formation of a contract. The employer shall not accept or incur any liability to a tenderer for such cancellation and rejection but will give written reasons for such action upon written request to do so.

F.1.5.2 The employer may not subsequent to the cancellation or abandonment of a tender process or the rejection of all responsive tender offers reissue a tender covering substantially the same scope of work within a period of six months unless only one tender was received, and such tender was returned unopened to the tenderer.

F.1.6 Procurement procedures

F.1.6.1 General

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

F.1.6.2 Competitive negotiation procedure

F.1.6.2.1 Where the tender data require that the competitive negotiation procedure is to be followed, tenderers shall submit tender offers in response to the proposed contract in the first round of submissions. Notwithstanding the requirements of F.3.4, the employer shall announce only the names of the tenderers who make a submission. The requirements of F.3.8 relating to the material deviations or qualifications which affect the competitive position of tenderers shall not apply.

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F.1.6.2.2 All responsive tenderers, or not less than three responsive tenderers that are highest ranked in terms of the evaluation method and evaluation criteria stated in the tender data, shall be invited in each round to enter into competitive negotiations, based on the principle of equal treatment and keeping confidential the proposed solutions and associated information. Notwithstanding the provisions of F.2.17, the employer may request that tenders be clarified, specified and fine-tuned in order to improve a tenderer's competitive position provided that such clarification, specification, fine tuning or additional information does not alter any fundamental aspects of the offers or impose substantial new requirements which restrict or distort competition or have a discriminatory effect.

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

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

F.1.6.3 Proposal procedure using the two-stage system

F.1.6.3.1 Option 1

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

F.1.6.3.2 Option 2

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

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

F.2 Tenderer's obligations

F.2.1 Eligibility

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

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

F.2.2 Cost of tendering

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

F.2.3 Check documents

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

F.2.4 Confidentiality and copyright of documents

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

F.2.5 Reference documents

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

F.2.6 Acknowledge addenda

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

F.2.7 Clarification meeting

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

F.2.8 Seek clarification

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

F.2.9 Insurance

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

F.2.10 Pricing the tender offer

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

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

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

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

F.2.11 Alterations to documents

Do not make any alterations or additions to the tender documents, except to comply with instructions issued by the employer, or necessary to correct errors made by the tenderer. All signatories to the tender offer shall initial all such alterations. Erasures and the use of masking fluid are prohibited.

F.2.12 Alternative tender offers

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

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

F.2.13 Submitting a tender offer

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

F.2.13.2 Return all returnable documents to the employer after completing them in their entirety, either electronically (if they were issued in electronic format) or by writing legibly in no erasable ink.

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

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

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

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

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

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

F.2.13.9 Accept that tender offers submitted by facsimile or email will be rejected by the employer, unless stated otherwise in the tender data.

F.2.14 Information and data to be completed in all respects

Accept that tender offers, which do not provide all the data or information requested completely and, in the form, required, may be regarded by the employer as nonresponsive.

F.2.15 Closing time

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

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

F.2.16 Tender offer validity

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

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

F.2.16.3 Accept that a tender submission that has been submitted to the employer may only be withdrawn or substituted by giving the employer's agent written notice before the closing time for tenders that a tender is to be withdrawn or substituted.

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

F.2.17 Clarification of tender offer after submission

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

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

F.2.18 Provide other material

F.2.18.1 Provide, on request by the employer, any other material that has a bearing on the tender offer, the tenderer's commercial position (including notarized joint venture agreements), preferencing arrangements, or samples of materials, considered necessary by the employer for the purpose of a full and fair risk assessment. Should the tenderer not provide the material, or a satisfactory reason as to why it cannot be provided, by the time for submission stated in the employer's request, the employer may regard the tender offer as non-responsive.

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

F.2.19 Inspections, tests and analysis

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

F.2.20 Submit securities, bonds, policies, etc.

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

F.2.21 Check final draft

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

F.2.22 Return of other tender documents

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

F.2.23 Certificates

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

F.3 The employer's undertakings

F.3.1 Respond to requests from the tenderer

F.3.1.1 Unless otherwise stated in the tender Data, respond to a request for clarification received up to five working days before the tender closing time stated in the Tender Data and notify all tenderers who drew procurement documents.

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

- a) an individual firm, or a joint venture as a whole, or any individual member of the joint venture fails to meet any of the collective or individual qualifying requirements.
- b) the new partners to a joint venture were not prequalified in the first instance, either as individual firms or as another joint venture; or
- c) in the opinion of the Employer, acceptance of the material change would compromise the outcome of the functionality process.

F.3.2 Issue Addenda

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

F.3.3 Return late tender offers

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

F.3.4 Opening of tender submissions

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

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

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

F.3.5 Two-envelope system

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

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

F.3.6 Non-disclosure

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

F.3.7 Grounds for rejection and disqualification

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

F.3.8 Test for responsiveness

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

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

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

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

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

F.3.9 Arithmetical errors, omissions and discrepancies

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

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

- the gross misplacement of the decimal point in any unit rate.
- omissions made in completing the pricing schedule or bills of quantities; or
- arithmetical errors in: i) line item totals resulting from the product of a unit rate and a quantity in bills of quantities or schedules of prices; or ii) the summation of the prices.

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

F.3.9.4 Where the tenderer elects to confirm the tender offer as tendered, correct the errors as follows:

- If bills of quantities or pricing schedules apply and there is an error in the line item total resulting from the product of the unit rate and the quantity, the line item total shall govern and the rate shall be corrected. Where there is an obviously gross

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misplacement of the decimal point in the unit rate, the line item total as quoted shall govern, and the unit rate shall be corrected.

- b) Where there is an error in the total of the prices either as a result of other corrections required by this checking process or in the tenderer's addition of prices, the total of the prices shall govern and the tenderer will be asked to revise selected item prices (and their rates if bills of quantities apply) to achieve the tendered total of the prices.

F.3.10 Clarification of a tender offer

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

F.3.11 Evaluation of tender offers

F.3.11.1 General

Appoint an evaluation panel of not less than three persons. Reduce each responsive tender offer to a comparative offer and evaluate them using the tender evaluation methods and associated evaluation criteria and weightings that are specified in the tender data.

F.3.11.2 Method 1: Financial offer

In the case of a financial offer:

- a) Rank tender offers from the most favourable to the least favourable comparative offer.
- b) Recommend the highest ranked tenderer for the award of the contract, unless there are compelling and justifiable reasons not to do so.
- c) Re-rank all tenderers should there be compelling and justifiable reasons not to recommend the highest ranked tenderer and recommend the highest ranked tenderer, unless there are compelling and justifiable reasons not to do so and the process set out in this sub clause is repeated.

F.3.11.4 Method 3: Financial offer and quality

In the case of a financial offer and quality:

- a) Score each tender in respect of the financial offer made and the quality offered in accordance with the provisions of F.3.11.7 and F.3.11.9, rejecting all tender offers that fail to score the minimum number of points for quality stated in the tender data, if any.
- b) Calculate the total number of tender evaluation points (TEV) in accordance with the following formula:
 $TEV = NFO + NQ$

where: NFO is the number of tender evaluation points awarded for the financial offer made in accordance with F.3.11.7.
 NQ is the number of tender evaluation points awarded for quality offered in accordance with F.3.11.9.

- c) Rank tender offers from the highest number of tender evaluation points to the lowest
- d) Recommend tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.
- e) Rescore and re-rank all tenderers should there be compelling and justifiable reasons not to recommend the tenderer with the highest number of tender evaluation points and recommend the tenderer with the highest number of tender evaluation points, unless there are compelling and justifiable reasons not to do so and the process set out in this sub clause is repeated.

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F.3.11.5 Method 4: Financial offer, quality and preferences

In the case of a financial offer, quality and preferences:

- Score each tender in respect of the financial offer made, preference claimed, if any, and the quality offered in accordance with the provisions of F.3.11.7 to F.3.11.9, rejecting all tender offers that fail to score the minimum number of points for quality stated in the tender data, if any.
- Calculate the total number of tender evaluation points (TEV) in accordance with the following formula, unless otherwise stated in the Tender Data:

$$TEV = NFO + NP + NQ$$

where: NFO is the number of tender evaluation points awarded for the financial offer made in accordance with F.3.11.7;
 NP is the number of tender evaluation points awarded for preferences claimed in accordance with F.3.11.8.
 NQ is the number of tender evaluation points awarded for quality offered in accordance with F.3.11.9.

- Rank tender offers from the highest number of tender evaluation points to the lowest.
- Recommend the tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.
- Rescore and re-rank all tenderers should there be compelling and justifiable reasons not to recommend the tenderer with the highest number of tender evaluation points and recommend the tenderer with the highest number of tender evaluation points, unless there are compelling and justifiable reasons not to do so and the process set out in this sub clause is repeated.

F.3.11.6 Decimal places

Score financial offers, preferences and quality, as relevant, to two decimal places.

F.3.11.7 Scoring Financial Offers

Score the financial offers of remaining responsive tender offers using the following formula:

$$NFO = W1 \times A$$

where: NFO is the number of tender evaluation points awarded for the financial offer.
 $W1$ is the maximum possible number of tender evaluation points awarded for the financial offer as stated in the Tender Data.
 A is a number calculated using the formula and option described in Table F.1 as stated in the Tender Data.

Table F.1: Formulae for calculating the value of A

Formula	Comparison aimed at achieving	Option 1a	Option 2 a
1	Highest price or discount	$(1 + \frac{(P - P_m)}{P_m})$	$A = P / P_m$
2	Lowest price or percentage commission / fee	$(1 - \frac{(P - P_m)}{P_m})$	$A = P_m / P$

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where:

P_m = the comparative offer of the most favourable tender offer.
P = the comparative offer of tender offer under consideration.

F.3.11.8 Scoring preferences

Confirm that tenderers are eligible for the preferences claimed in accordance with the provisions of the tender data and reject all claims for preferences where tenderers are not eligible for such preferences. Calculate the total number of tender evaluation points for preferences claimed in accordance with the provisions of the tender data.

F.3.11.9 Scoring quality

Score each of the criteria and sub criteria for quality in accordance with the provisions of the Tender Data.
Calculate the total number of tender evaluation points for quality using the following formula:

$$NQ = W2 \times SO / MS$$

where: SO is the score for quality allocated to the submission under consideration.
MS is the maximum possible score for quality in respect of a submission; and
W2 is the maximum possible number of tender evaluation points awarded for the quality as stated in the tender data

F.3.12 Insurance provided by the employer

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

F.3.13 Acceptance of tender offer

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

- is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement,
- can, as necessary and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract,
- has the legal capacity to enter into the contract,
- is not insolvent, in receivership, bankrupt or being wound up, has his affairs administered by a court or a judicial officer, has suspended his business activities, or is subject to legal proceedings in respect of any of the foregoing,
- complies with the legal requirements, if any, stated in the tender data, and
- is able, in the opinion of the employer, to perform the contract free of conflicts of interest.

F.3.14 Prepare contract documents

F.3.14.1 If necessary, revise documents that shall form part of the contract and that were issued by the employer as part of the tender documents to take account of:

- addenda issued during the tender period,
- inclusion of some of the returnable documents, and
- other revisions agreed between the employer and the successful tenderer.

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

F.3.15 Complete adjudicator's contract

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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.

F.3.16 Notice to unsuccessful tenderers

F.3.16.1 Notify the successful tenderer of the employer's acceptance of his tender offer by completing and returning one copy of the form of offer and acceptance before the expiry of the validity period stated in the tender data, or agreed additional period.

F.3.16.2 After the successful tenderer has been notified of the employer's acceptance of the tender, notify other tenderers that their tender offers have not been accepted.

F.3.17 Provide copies of the contracts

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

F.3.18 Provide written reasons for actions taken

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

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THE TENDER PART T2: RETURNABLE DOCUMENTS

- T2.1 List of Returnable Documents**
T2.2 Returnable Documents

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T2.1 List of returnable documents

1. Tenderers will be required to submit the following with within seven days of receipt of the Employer's written request for same:
 - (a) Certified copy of a Workmen's Compensation Certificate, Act 4 of 2002,
 - (b) Certified copy of Unemployment Insurance Certificate, Act 4 of 2002,
 - (c) Curriculum vitae of the person who prepares the Contractor's Health and Safety Plan, and
 - (d) Curriculum vitae of the Health and Safety Officer the successful tenderer intends appointing in accordance with the Occupational Health and Safety Act (Act 85 of 1993).
 - (e) Curriculum Vitae of all supervisory staff.
 - (f) Insurance
 - (g) Guarantee
2. The returnable schedules included in Section T2.2 will be used to evaluate tenders received. These schedules will also form part of the Contract.

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T2.2 Returnable schedules

1. Returnable Schedules required only for tender evaluation purposes

T2.2.1	Record of Addenda to Tender Documents
T2.2.2	Compulsory Enterprise Questionnaire
T2.2.3	Certificate of authority for joint ventures (where applicable)
T2.2.4	Schedule of Proposed Subcontractors
T2.2.5	Schedule of Plant and Equipment
T2.2.6	Schedule of the Tenderer's Experience
T2.2.7	Financial References
T2.2.8	Proposed Amendments and Qualifications
T2.2.9	Supervisory and Safety Personnel
T2.2.10	Labour Utilisation
T2.2.11	Compliance with OHSA (Act 85 of 1993)
T2.2.12	Site Inspection Certificate
T2.2.13	Authority of Signatory
T2.2.14	General Conditions of Contract
T2.2.15	MBD Pricing Schedule
T2.2.16	MBD 4 Declaration of Interest
T2.2.17	MBD 5 Declaration of Procurement above R 10 million
T2.2.18	MBD 6.1 Preference Points Claim Form in terms of PPR 2011
T2.2.19	MBD 6.2 Declaration certificate for local production and content for designated sectors
T2.2.20	MBD 8 Past Supply Chain Management Practices
T2.2.21	MBD 9 Certificate of Independent Bid Determination
T2.2.22	Section 38 – Declaration Form
T2.2.23	Confirmation of Outstanding Municipal Rates and Taxes

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T2.2.1: Record of Addenda to tender documents

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

	Date	Title or Details
1.		
2.		
3.		
4.		
5.		
6.		

Attach additional pages if more space is required.

Signed

Date

Name

Position

Tenderer

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T2.2.2: 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 of 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
☐ a member of any provincial legislature
☐ a member of the National Assembly or the Council of Province
☐ a member of the board of directors of any municipal entity
☐ an official of any municipality or municipal entity | ☐ an employee of any provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act 1 of 1999)
☐ a member of an accounting authority of any national or provincial public entity
☐ an employee of Parliament or a provincial legislature |
|---|---|

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

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*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
☐ a member of any provincial legislature
☐ a member of the National Assembly or the National Council of Province
☐ a member of the board of directors of any municipal entity
☐ an official of any municipality or municipal entity | ☐ an employee of any provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act 1 of 1999)
☐ 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 o state and position held	Status of service (tick appropriate column)	
		cu rent	Within last 12 months

*insert separate page if necessary

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;
- 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.

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Signed _____

Date _____

Name _____

Position _____

Enterprise
name _____

.....

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T2.2.3: Certificate of Authority for Joint Ventures

This Returnable Schedule is to be completed by joint ventures.

We, the undersigned, are submitting this tender offer in Joint Venture and hereby authorise Mr/Ms
....., authorised signatory of the company , acting
in the capacity of lead partner, to sign all documents in connection with the tender offer and any contract resulting from it on our behalf.

NAME OF FIRM	ADDRESS	DULY AUTHORISED SIGNATORY
<i>Lead partner</i>		Signature. Name Designation
		Signature. Name Designation
		Signature. Name Designation
		Signature. Name Designation

Employer

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T2.2.4: Schedule of Proposed Subcontractors

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.

We confirm that all subcontractors who are contracted to construct a house are registered as home builders with the National Home Builders Registration Council.

	Name and address of proposed Subcontractor	Nature and extent of work	Previous experience with Subcontractor.
1.			
2.			
3.			
4.			
5.			

Signed _____

Date _____

Name _____

Position _____

Tenderer _____

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T2.2.5: Schedule of Plant and Equipment

The following are lists of major items of relevant equipment that I/we presently own or lease and will have available for this contract or will acquire or hire for this contract if my/our tender is accepted.

(a) Details of major equipment that is owned by and immediately available for this contract.

Quantity	Description, size, capacity, etc.

Attach additional pages if more space is required.

(b) Details of major equipment that will be hired or acquired for this contract if my/our tender is acceptable.

Quantity	Description, size, capacity, etc.

Attach additional pages if more space is required.

Signed

Date

Name

Position

Tenderer

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T2.2.6: Schedule of the Tenderer's Experience

The following is a statement of similar work successfully executed / in progress by myself/ourselves in the last 5 years:

Employer, contact person and telephone number.	Description of contract	Value of work inclusive of VAT (Rand)	Date completed

Signed _____

Date _____

Name _____

Position _____

Tenderer _____

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T2.2.7: Financial References

(a) FINANCIAL STATEMENTS

I/We agree, if required, to furnish an audited copy of the latest set of financial statements together with my/our Directors' and Auditors' report for consideration by the Employer.

(b) DETAILS OF COMPANY'S BANK

I/We hereby authorise the Employer/Engineer to approach all or any of the following banks for a reference:

DESCRIPTION OF BANK DETAIL	BANK DETAIL APPLICABLE TO COMPANY HEAD OFFICE	BANK DETAIL APPLICABLE TO THE SITE OF THE WORKS
Name of bank		
Branch name		
Branch code		
Street address		
Postal address		
Name of manager		
Telephone number	()	()
Fax number	()	()
Account number		

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Witness 2



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BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

THE TENDER
Part T2: Returnable Documents

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Employer

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Contractor

Witness 1

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T2.2.8: 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

THE TENDER
Part T2: Returnable Documents

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T2.2.9: Supervisory and Safety Personnel

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

Name	% Time on Site	Position (Current)	Service (Years)	Name of Project And year executed	Value of Works	Position Occupied
Contracts Manager						
Contractor's Site Agent	100%					
Contractor's Foremen						
Construction Health and Safety Officer	100%					
Contractors Surveyor						

Tenderers shall indicate the percentage of working time these persons will be engaged on site. Tenderers are required to provide copies of curriculum vitas of all supervisory and safety personnel.

Signed

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Date

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Name

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Position

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Tenderer

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Employer

Witness 1

Witness 2

Contractor

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T2.2.10: 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 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 portion of the works; and
- 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 control and supervision.
- c) Ensuring safety on the workplace.
- d) Maintaining discipline; and
- e) Being directly responsible to a general foreman or foreman or the Contractor or the Contractor's representative for efficiency and production for his portion of the works.

3. Artisan

An employee who has successfully completed all prescribed courses at a practical institutional training center 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.
- 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.

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Employer

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Witness 1

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Witness 2

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Contractor

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Witness 1

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Witness 2

8. Imported Employee

Personnel permanently employed by Contractor.

9. Local Employee

Temporary workforce employed through Labour Desk.

MAN DAYS

Categories	a) No. of Man Days		d) HDI (Y/N)
	b) Imported	c) 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			

Employer

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Categories	a) No. of Man Days		
	b) Imported	c) Local	d) HDI (Y/N)
7. Operators/Drivers			
8. Clerks/ Storeman			
9. Team Leader			
10. Skilled Labour			
11. Semi-skilled Labour			
12. Unskilled Labour			

Signed _____

Date _____

Name _____

Position _____

Tenderer _____

Employer

Witness 1

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Contractor

Witness 1

Witness 2

T2.2.11: Occupational Health and Safety Act: Statement by Tendering Entity

I, _____ duly authorised

to represent _____ (company name)

in my capacity as _____ hereby confirm that I accept full and exclusive responsibility for compliance by myself and all persons who perform work for me with the provisions of the Occupational Health and Safety Act, No. 85 of 1993 (as amended) and all regulations promulgated from time to time, whilst performing work on _____

I confirm that all employees who perform work on the site shall be properly trained to do this in a manner which is safe and without risk to health and safety to themselves and others in the vicinity and undertake to have our activities adequately supervised in the interest of health and safety.

Signed _____ Date _____

Name _____ Position _____

Tenderer _____

Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2

T2.2.12: Site Inspection Certificate

As required by Clause 2.7 of the Tender Data, I/we certify that I/we have visited the site of the Works and attended the site visit and clarification meeting on the date certified below.

I/we further certify that I am / we are satisfied with the description of the Work and the explanations given by the Engineer at the site visit and clarification meeting.

Signature of Tenderer

Date

Site Visit

This will certify that _____

representing _____

attended a Site Inspection for this Contract on _____ 20_____

_____(signed)
For the Engineer

Employer

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Witness 2

T2.2.13: Authority of Signatory

With reference to Clause 2.13.4 of the Tender Data, I/we herewith certify that this tender is submitted by: *(Mark applicable block)*

a company, and attach hereto a certified copy of the required resolution of the Board of Directors ☐

a partnership, and attach hereto a certified copy of the required resolution by all partners ☐

a close corporation, and attach hereto a certified copy of the required resolution of the Board of Officials ☐

a one-man business, and attach hereto certified proof that I am the sole owner of the business submitting this tender ☐

a joint venture, and attach hereto ☐

- an 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

Signed	_____	Date	_____
Name	_____	Position	_____

Tenderer _____

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2



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T2.2.14: General Conditions of Contract

(NOT TO BE ALTERED)

PROCUREMENT: GENERAL CONDITIONS OF CONTRACT
Dated July 2010 as set out by the National Treasury: Republic of South Africa

TABLE OF CLAUSES

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2. Application
3. General
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5. Use of contract documents and information inspection
6. Patent Rights
7. Performance security
8. Inspections, tests and analyses
9. Packing
10. Delivery and documents
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15. Warranty
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20. Subcontracts
21. Delays in the supplier's performance
22. Penalties
23. Termination for default
24. Anti-dumping and countervailing duties and rights
25. Force Majeure
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28. Limitation of Liability
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31. Notices
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33. Transfer of contracts
34. Amendments of contracts
35. Prohibition of restrictive practices

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Employer

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Witness 1

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Witness 2

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Contractor

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General Conditions of Contract

1. Definitions

1. The following terms shall be interpreted as indicated:

- 1.1 "Closing time" means the date and hour specified in the bidding documents for the receipt of bids.
- 1.2 "Contract" means the written agreement entered into between the purchaser and the supplier, as recorded in the contract form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.
- 1.3 "Contract price" means the price payable to the supplier under the contract for the full and proper performance of his contractual obligations.
- 1.4 "Corrupt practice" means the offering, giving, receiving, or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution.
- 1.5 "Countervailing duties" are imposed in cases where an enterprise abroad is subsidized by its government and encouraged to market its products internationally.
- 1.6 "Country of origin" means the place where the goods were mined, grown or produced or from which the services are supplied. Goods are produced when, through manufacturing, processing or substantial and major assembly of components, a commercially recognized new product results that is substantially different in basic characteristics or in purpose or utility from its components.
- 1.7 "Day" means calendar day.
- 1.8 "Delivery" means delivery in compliance of the conditions of the contract or order.
- 1.9 "Delivery ex stock" means immediate delivery directly from stock actually on hand.
- 1.10 "Delivery into consignees store or to his site" means delivered and unloaded in the specified store or depot or on the specified site in compliance with the conditions of the contract or order, the supplier bearing all risks and charges involved until the goods are so delivered and a valid receipt is obtained.
- 1.11 "Dumping" occurs when a private enterprise abroad market its goods on own initiative in the RSA at lower prices than that of the country of origin and which have the potential to harm the local industries in the RSA.
- 1.12 "Force majeure" means an event beyond the control of the supplier and not involving the supplier's fault or negligence and not foreseeable. Such events may include, but is not restricted to, acts of the purchaser in its sovereign capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.
- 1.13 "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of any bidder, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the bidder of the benefits of free and open competition.

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- 1.14 "GCC" means the General Conditions of Contract.
- 1.15 "Goods" means all of the equipment, machinery, and/or other materials that the supplier is required to supply to the purchaser under the contract.
- 1.16 "Imported content" means that portion of the bidding price represented by the cost of components, parts or materials which have been or are still to be imported (whether by the supplier or his subcontractors) and which costs are inclusive of the costs abroad, plus freight and other direct importation costs such as landing costs, dock dues, import duty, sales duty or other similar tax or duty at the South African place of entry as well as transportation and handling charges to the factory in the Republic where the goods covered by the bid will be manufactured.
- 1.17 "Local content" means that portion of the bidding price, which is not included in the imported content provided that local manufacture does take place.
- 1.18 "Manufacture" means the production of products in a factory using labour, materials, components and machinery and includes other related value-adding activities.
- 1.19 "Order" means an official written order issued for the supply of goods or works or the rendering of a service.
- 1.20 "Project site," where applicable, means the place indicated in bidding documents.
- 1.21 "Purchaser" means the organization purchasing the goods.
- 1.22 "Republic" means the Republic of South Africa.
- 1.23 "SCC" means the Special Conditions of Contract.
- 1.24 "Services" means those functional services ancillary to the supply of the goods, such as transportation and any other incidental services, such as installation, commissioning, provision of technical assistance, training, catering, gardening, security, maintenance and other such obligations of the supplier covered under the contract.
- 1.25 "Supplier" means the successful bidder who is awarded the contract to maintain and administer the required and specified service(s) to the State.
- 1.26 "Tort" means in breach of contract.
- 1.27 "Turnkey" means a procurement process where one service provider assumes total responsibility for all aspects of the project and delivers the full end product / service required by the contract.
- 1.28 "Written" or "in writing" means hand-written in ink or any form of electronic or mechanical writing.

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2. Application

- 2.1. These general conditions are applicable to all bids, contracts and orders including bids for functional and professional services (excluding professional services related to the building and construction industry), sales, hiring, letting and the granting or acquiring of rights, but excluding immovable property, unless otherwise indicated in the bidding documents.
- 2.2. Where applicable, special conditions of contract are also laid down to cover specific goods, services or works.
- 2.3. Where such special conditions of contract are in conflict with these general conditions, the special conditions shall apply.

3. General

- 3.1. Unless otherwise indicated in the bidding documents, the purchaser shall not be liable for any expense incurred in the preparation and submission of a bid. Where applicable a nonrefundable fee for documents may be charged.
- 3.2. Invitations to bid are usually published in locally distributed news media and on the municipality/municipal entity website.

4. Standards

- 4.1. The goods supplied shall conform to the standards mentioned in the bidding documents and specifications.

5. Use of contract documents and information inspection

- 5.1. The supplier shall not, without the purchaser's prior written consent, disclose the contract, or any provision thereof, or any specification, plan, drawing, pattern, sample, or information furnished by or on behalf of the purchaser in connection therewith, to any person other than a person employed by the supplier in the performance of the contract. Disclosure to any such employed person shall be made in confidence and shall extend only as far as may be necessary for purposes of such performance.
- 5.2. The supplier shall not, without the purchaser's prior written consent, make use of any document or information mentioned in GCC clause 5.1 except for purposes of performing the contract.
- 5.3. Any document, other than the contract itself mentioned in GCC clause 5.1 shall remain the property of the purchaser and shall be returned (all copies) to the purchaser on completion of the supplier's performance under the contract if so required by the purchaser.
- 5.4. The supplier shall permit the purchaser to inspect the supplier's records relating to the performance of the supplier and to have them audited by auditors appointed by the purchaser, if so required by the purchaser.

6. Patent Rights

- 6.1. The supplier shall indemnify the purchaser against all third-party claims of infringement of patent, trademark, or industrial design rights arising from use of the goods or any part thereof by the purchaser.
- 6.2. When a supplier developed documentation / projects for the municipality / municipal entity, the intellectual, copy and patent rights or ownership of such documents or projects will vest in the municipality / municipal entity.

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7. Performance security

- 7.1. Within thirty (30) days of receipt of the notification of contract award, the successful bidder shall furnish to the purchaser the performance security of the amount specified in SCC.
- 7.2. The proceeds of the performance security shall be payable to the purchaser as compensation for any loss resulting from the supplier's failure to complete his obligations under the contract.
- 7.3. The performance security shall be denominated in the currency of the contract or in a freely convertible currency acceptable to the purchaser and shall be in one of the following forms:
- (a) a bank guarantee or an irrevocable letter of credit issued by a reputable bank located in the purchaser's country or abroad, acceptable to the purchaser, in the form provided in the bidding documents or another form acceptable to the purchaser; or
- (b) a cashier's or certified cheque.
- 7.4. The performance security will be discharged by the purchaser and returned to the supplier not later than thirty (30) days following the date of completion of the supplier's performance obligations under the contract, including any warranty obligations, unless otherwise specified.

8. Inspections, tests and analyses

- 8.1 All pre-bidding testing will be for the account of the bidder.
- 8.2 If it is a bid condition that goods to be produced or services to be rendered should at any stage be subject to inspections, tests and analyses, the bidder or contractor's premises shall be open, at all reasonable hours, for inspection by a representative of the purchaser or organization acting on behalf of the purchaser.
- 8.3 If there are no inspection requirements indicated in the bidding documents and no mention is made in the contract, but during the contract period it is decided that inspections shall be carried out, the purchaser shall itself make the necessary arrangements, including payment arrangements with the testing authority concerned.
- 8.4 If the inspections, tests and analyses referred to in clauses 8.2 and 8.3 show the goods to be in accordance with the contract requirements, the cost of the inspections, tests and analyses shall be defrayed by the purchaser.
- 8.5 Where the goods or services referred to in clauses 8.2 and 8.3 do not comply with the contract requirements, irrespective of whether such goods or services are accepted or not, the cost in connection with these inspections, tests or analyses shall be defrayed by the supplier.
- 8.6 Goods and services which are referred to in clauses 8.2 and 8.3 and which do not comply with the contract requirements may be rejected.
- 8.7 Any contract goods may on or after delivery be inspected, tested or analysed and may be rejected if found not to comply with the requirements of the contract. Such rejected goods shall be held at the cost and risk of the supplier who shall, when called upon, remove them immediately at his own cost and forthwith substitute them with goods, which do comply with the requirements of the contract. Failing such removal the rejected goods shall be returned at the suppliers cost and risk.

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Should the supplier fail to provide the substitute goods forthwith, the purchaser may, without giving the supplier further opportunity to substitute the rejected goods, purchase such goods as may be necessary at the expense of the supplier.

- 8.8 The provisions of clauses 8.4 to 8.7 shall not prejudice the right of the purchaser to cancel the contract on account of a breach of the conditions thereof, or to act in terms of Clause 22 of GCC.

9. Packing

- 9.1. The supplier shall provide such packing of the goods as is required to prevent their damage or deterioration during transit to their final destination, as indicated in the contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage. Packing, case size weights shall take into consideration, where appropriate, the remoteness of the goods' final destination and the absence of heavy handling facilities at all points in transit.
- 9.2. The packing, marking, and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the contract, including additional requirements, if any, and in any subsequent instructions ordered by the purchaser.

10. Delivery and documents

- 10.1. Delivery of the goods and arrangements for shipping and clearance obligations shall be made by the supplier in accordance with the terms specified in the contract.

11. Insurance

- 11.1. The goods supplied under the contract shall be fully insured in a freely convertible currency against loss or damage incidental to manufacture or acquisition, transportation, storage and delivery in the manner specified.

12. Transportation

- 12.1. Should a price other than an all-inclusive delivered price be required, this shall be specified.

13. Incidental Services

- 13.1. The supplier may be required to provide any or all of the following services, including additional services, if any:
- (a) performance or supervision of on-site assembly and/or commissioning of the supplied goods.
 - (b) furnishing of tools required for assembly and/or maintenance of the supplied goods.
 - (c) furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied goods.
 - (d) performance or supervision or maintenance and/or repair of the supplied goods, for a period of time agreed by the parties, provided that this service shall not relieve the supplier of any warranty obligations under this contract; and
 - (e) training of the purchaser's personnel, at the supplier's plant and/or on-site, in assembly, start-up, operation, maintenance, and/or repair of the supplied goods.
- 13.2. Prices charged by the supplier for incidental services, if not included in the contract price for the goods, shall be agreed upon in advance by the parties and shall not exceed the prevailing rates charged to other parties by the supplier for similar services.

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14. Spare parts

14.1. As specified, the supplier may be required to provide any or all of the following materials, notifications, and information pertaining to spare parts manufactured or distributed by the supplier:

- (a) such spare parts as the purchaser may elect to purchase from the supplier, provided that this election shall not relieve the supplier of any warranty obligations under the contract, and.
- (b) in the event of termination of production of the spare parts:
 - (i) advance notification to the purchaser of the pending termination, in sufficient time to permit the purchaser to procure needed requirements; and
 - (ii) following such termination, furnishing at no cost to the purchaser, the blueprints, drawings, and specifications of the spare parts, if requested.

15. Warranty

- 15.1. The supplier warrants that the goods supplied under the contract are new, unused, of the most recent or current models and that they incorporate all recent improvements in design and materials unless provided otherwise in the contract. The supplier further warrants that all goods supplied under this contract shall have no defect, arising from design, materials, or workmanship (except when the design and/or material is required by the purchaser's specifications) or from any act or omission of the supplier, that may develop under normal use of the supplied goods in the conditions prevailing in the country of final destination.
- 15.2. This warranty shall remain valid for twelve (12) months after the goods, or any portion thereof as the case may be, have been delivered to and accepted at the final destination indicated in the contract, or for eighteen (18) months after the date of shipment from the port or place of loading in the source country, whichever period concludes earlier, unless specified otherwise.
- 15.3. The purchaser shall promptly notify the supplier in writing of any claims arising under this warranty.
- 15.4. Upon receipt of such notice, the supplier shall, within the period specified and with all reasonable speed, repair or replace the defective goods or parts thereof, without costs to the purchaser.
- 15.5. If the supplier, having been notified, fails to remedy the defect(s) within the period specified, the purchaser may proceed to take such remedial action as may be necessary, at the supplier's risk and expense and without prejudice to any other rights which the purchaser may have against the supplier under the contract.

16. Payment

- 16.1. The method and conditions of payment to be made to the supplier under this contract shall be specified.
- 16.2. The supplier shall furnish the purchaser with an invoice accompanied by a copy of the delivery note and upon fulfillment of other obligations stipulated in the contract.
- 16.3. Payments shall be made promptly by the purchaser, but in no case later than thirty (30) days after submission of an invoice or claim by the supplier.

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16.4. Payment will be made in Rand unless otherwise stipulated.

16.5.

17. Prices

17.1. Prices charged by the supplier for goods delivered and services performed under the contract shall not vary from the prices quoted by the supplier in his bid, with the exception of any price adjustments authorized or in the purchaser's request for bid validity extension, as the case may be.

18. Variation orders

18.1. In cases where the estimated value of the envisaged changes in purchase does not vary more than 15% of the total value of the original contract, the contractor may be instructed to deliver the goods or render the services as such. In cases of measurable quantities, the contractor may be approached to reduce the unit price, and such offers may be accepted provided that there is no escalation in price.

19. Assignment

19.1. The supplier shall not assign, in whole or in part, its obligations to perform under the contract, except with the purchaser's prior written consent.

20. Subcontracts

20.1. The supplier shall notify the purchaser in writing of all subcontracts awarded under these contracts if not already specified in the bid. Such notification, in the original bid or later, shall not relieve the supplier from any liability or obligation under the contract.

21. Delays in the supplier's delivery and/or performance

21.1. Delivery of the goods and performance of services shall be made by the supplier in accordance with the time schedule prescribed by the purchaser in the contract.

21.2. If at any time during performance of the contract, the supplier or its subcontractor(s) should encounter conditions impeding timely delivery of the goods and performance of services, the supplier shall promptly notify the purchaser in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the supplier's notice, the purchaser shall evaluate the situation and may at his discretion extend the supplier's time for performance, with or without the imposition of penalties, in which case the extension shall be ratified by the parties by amendment of contract.

21.3. The right is reserved to procure outside of the contract small quantities or to have minor essential services executed if an emergency arises, the supplier's point of supply is not situated at or near the place where the goods are required, or the supplier's services are not readily available.

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- 21.4. Except as provided under GCC Clause 25, a delay by the supplier in the performance of its delivery obligations shall render the supplier liable to the imposition of penalties, pursuant to GCC Clause 22, unless an extension of time is agreed upon pursuant to GCC Clause 22.2 without the application of penalties.
- 21.5. Upon any delay beyond the delivery period in the case of a goods contract, the purchaser shall, without cancelling the contract, be entitled to purchase goods of a similar quality and up to the same quantity in substitution of the goods not supplied in conformity with the contract and to return any goods delivered later at the supplier's expense and risk, or to cancel the contract and buy such goods as may be required to complete the contract and without prejudice to his other rights, be entitled to claim damages from the supplier.

22. Penalties

- 22.1. Subject to GCC Clause 25, if the supplier fails to deliver any or all of the goods or to perform the services within the period(s) specified in the contract, the purchaser shall, without prejudice to its other remedies under the contract, deduct from the contract price, as a penalty, a sum calculated on the delivered price of the delayed goods or unperformed services using the current prime interest rate calculated for each day of the delay until actual delivery or performance. The purchaser may also consider termination of the contract pursuant to GCC Clause 23.

23. Termination for default

- 23.1. The purchaser, without prejudice to any other remedy for breach of contract, by written notice of default sent to the supplier, may terminate this contract in whole or in part:
- (a) if the supplier fails to deliver any or all of the goods within the period(s) specified in the contract, or within any extension thereof granted by the purchaser pursuant to GCC Clause 21.2;
 - (b) if the supplier fails to perform any other obligation(s) under the contract; or
 - (c) if the supplier, in the judgment of the purchaser, has engaged in corrupt or fraudulent practices in competing for or in executing the contract.
- 23.2. In the event the purchaser terminates the contract in whole or in part, the purchaser may procure, upon such terms and in such manner, as it deems appropriate, goods, works or services similar to those undelivered, and the supplier shall be liable to the purchaser for any excess costs for such similar goods, works or services. However, the supplier shall continue performance of the contract to the extent not terminated.
- 23.3. Where the purchaser terminates the contract in whole or in part, the purchaser may decide to impose a restriction penalty on the supplier by prohibiting such supplier from doing business with the public sector for a period not exceeding 10 years.
- 23.4. If a purchaser intends imposing a restriction on a supplier or any person associated with the supplier, the supplier 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 supplier fail to respond within the stipulated fourteen (14) days the purchaser may regard the supplier as having no objection and proceed with the restriction.
- 23.5. Any restriction imposed on any person by the purchaser will, at the discretion of the purchaser, 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 purchaser actively associated.

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Employer

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Witness 1

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Witness 2

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Contractor

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Witness 1

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Witness 2



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

- (i) the name and address of the supplier and / or person restricted by the purchaser.
- (ii) the date of commencement of the restriction
- (iii) the period of restriction; and
- (iv) the reasons for the restriction.

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

23.7. 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

24. Antidumping and countervailing duties and rights

24.1. When, after the date of bid, provisional payments are required, or anti-dumping or countervailing duties are imposed, or the amount of a provisional payment or anti-dumping or countervailing right is increased in respect of any dumped or subsidized import, the State is not liable for any amount so required or imposed, or for the amount of any such increase. When, after the said date, such a provisional payment is no longer required or any such anti-dumping or countervailing right is abolished, or where the amount of such provisional payment or any such right is reduced, any such favourable difference shall on demand be paid forthwith by the supplier to the purchaser or the purchaser may deduct such amounts from moneys (if any) which may otherwise be due to the supplier in regard to goods or services which he delivered or rendered, or is to deliver or render in terms of the contract or any other contract or any other amount which may be due to him.

25. Force Majeure

25.1. Notwithstanding the provisions of GCC Clauses 22 and 23, the supplier shall not be liable for forfeiture of its performance security, damages, or termination for default if and to the extent that his delay in Performance or other failure to perform his obligations under the contract is the result of an event of force majeure.

25.2. If a force majeure situation arises, the supplier shall promptly notify the purchaser in writing of such condition and the cause thereof. Unless otherwise directed by the purchaser in writing, the supplier shall continue to perform its obligations under the contract as far as is reasonably practical and shall seek all reasonable alternative means for performance not prevented by the force majeure event.

26. Termination for insolvency

26.1. The purchaser may at any time terminate the contract by giving written notice to the supplier if the supplier becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the supplier, provided that such

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termination will not prejudice or affect any right of action or remedy, which has accrued or will accrue thereafter to the purchaser.

27. Settlement of Disputes

- 27.1. If any dispute or difference of any kind whatsoever arises between the purchaser and the supplier in connection with or arising out of the contract, the parties shall make every effort to resolve amicably such dispute or difference by mutual consultation.
- 27.2. If, after thirty (30) days, the parties have failed to resolve their dispute or difference by such mutual consultation, then either the purchaser or the supplier may give notice to the other party of his intention to commence with mediation. No mediation in respect of this matter may be commenced unless such notice is given to the other party.
- 27.3. Should it not be possible to settle a dispute by means of mediation, it may be settled in a South African court of law.
- 27.4. Notwithstanding any reference to mediation and/or court proceedings herein,
- (a) the parties shall continue to perform their respective obligations under the contract unless they otherwise agree; and
- (b) the purchaser shall pay the supplier any monies due the supplier for goods delivered and / or services rendered according to the prescripts of the contract.

28. Limitation of Liability

- 28.1 Except in cases of criminal negligence or willful misconduct, and in the case of infringement pursuant to Clause 6;
- (a) the supplier shall not be liable to the purchaser, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage does not apply to any obligation of the supplier to pay penalties and/or damages to the purchaser; and
- (b) the aggregate liability of the supplier to the purchaser, whether under the contract, in tort or otherwise, shall not exceed the total contract price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment.

29. Governing language

- 29.1. The contract shall be written in English. All correspondence and other documents pertaining to the contract that is exchanged by the parties shall also be written in English.

30. Applicable law

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

31. Notices

- 31.1. Every written acceptance of a bid shall be posted to the supplier concerned by registered or certified mail and any other notice to him shall be posted by ordinary mail to the address furnished in his bid or to the address notified later by him in writing and such posting shall be deemed to be proper service of such notice.
- 31.2. 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 posting of such notice.

Employer

Witness 1

Witness 2

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32. Taxes and duties

- 32.1. A foreign supplier shall be entirely responsible for all taxes, stamp duties, license fees, and other such levies imposed outside the purchaser's country.
- 32.2. A local supplier shall be entirely responsible for all taxes, duties, license fees, etc., incurred until delivery of the contracted goods to the purchaser.
- 32.3. No contract shall be concluded with any bidder whose tax matters are not in order. Prior to the award of a bid SARS must have certified that the tax matters of the preferred bidder are in order.
- 32.4. No contract shall be concluded with any bidder whose municipal rates and taxes and municipal services charges are in arrears.

33. Transfer of contracts

- 33.1. The contractor shall not abandon, transfer, cede assign or sublet a contract or part thereof without the written permission of the purchaser

34. Amendment of contracts

- 34.1. No agreement to amend or vary a contract or order or the conditions, stipulations or provisions thereof shall be valid and of any force unless such agreement to amend or vary is entered into in writing and signed by the contracting parties. Any waiver of the requirement that the agreement to amend or vary shall be in writing, shall also be in writing.

35. Prohibition of restrictive practices

- 35.1. 35.1 In terms of section 4 (1) (b) (iii) of the Competition Act No. 89 of restrictive practices 1998, as amended, an agreement between, or concerted practice by, firms, or a decision by an association of firms, is prohibited if it is between parties in a horizontal relationship and if a bidder(s) is / are or a contractor(s) was / were involved in collusive bidding.
- 35.2. If a bidder(s) or contractor(s) based on reasonable grounds or evidence obtained by the purchaser has / have engaged in the restrictive practice referred to above, the purchaser may refer the matter to the Competition Commission for investigation and possible imposition of administrative penalties as contemplated in section 59 of the Competition Act No 89 Of 1998.
- 35.3. If a bidder(s) or contractor(s) has / have been found guilty by the Competition Commission of the restrictive practice referred to above, the purchaser may, in addition and without prejudice to any other remedy provided for, invalidate the bid(s) for such item(s) offered, and / or terminate the contract in whole or part, and / or restrict the bidder(s) or contractor(s) from conducting business with the public sector for a period not exceeding ten (10) years and / or claim damages from the bidder(s) or contractor(s) concerned.

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Witness 1

Witness 2

Contractor

Witness 1

Witness 2



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SPECIAL CONDITIONS OF CONTRACT

Termination by Employer and Appointment of a completion Service Provider (Contractor)

In an event where the successful Service Provider (Contractor) has failed to execute the contract as per the conditions of the contract, thus resulting in termination of the contract as per **Clauses 9.2.1.1, 9.2.1.2, 9.2.1.3 (1)(2)(3)(4)(5)(6)(7)(8)**, of the **General Conditions of Contract 2015, Third Edition**. Then, the Employer (Rustenburg Local Municipality) reserves the right to appoint the second highest scoring bidder in the same tender for completion of the contract.
Any incurred losses and damages will be claimed against the terminated Service Provider (Contractor).

Employer

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Contractor

Witness 1

Witness 2



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T2.2.16:

MBD 4: DECLARATION OF INTEREST

No bid will be accepted from 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 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.

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? [TICK APPLICABLE BOX] ☐ 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

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Employer

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Witness 1

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Witness 2

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Contractor

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Witness 1

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Witness 2



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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.

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?

[TICK APPLICABLE BOX] ☐ 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?

[TICK APPLICABLE BOX] ☐ 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 whomay be involved with the
evaluation and or adjudication of this bid?

[TICK APPLICABLE BOX] ☐ 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?

[TICK APPLICABLE BOX] ☐ 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?

[TICK APPLICABLE BOX] ☐ 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

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



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or not they are bidding for this contract.

[TICK APPLICABLE BOX]

☐ YES / ☐ NO

3.14.1 If yes, furnish particulars.....

.....

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Employer

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Witness 1

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Witness 2

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Contractor

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Witness 1

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Witness 2



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

Full Name	Identity Number	Personal Reference Tax Number	State Employee Number

.....
Signature

.....
Date

.....
Capacity

.....
Name of Bidder

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



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T2.2.17:

MBD 5

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

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

- 1 Are you by law required to prepare annual financial statements for auditing? [TICK APPLICABLE BOX] ☐ *YES / ☐ NO
- 1.1 If yes, submit audited annual financial statements for the past three years or since the date of establishment if established during the past three years.
-
-
- 2 Do you have any outstanding undisputed commitments for municipal services towards any municipality for more than three months or any other service provider in respect of which payment is overdue for more than 30 days? [TICK APPLICABLE BOX] ☐ *YES / ☐ NO
- 2.1 If no, this serves to certify that the bidder has no undisputed commitments for municipal services towards any municipality for more than three months or other service provider in respect of which payment is overdue for more than 30 days.
- 2.2 If yes, provide particulars.
-
-
-
- 3 Has any contract been awarded to you by an organ of state during the past five years, including particulars of any material non-compliance or dispute concerning the execution of such contract? [TICK APPLICABLE BOX] ☐ *YES / ☐ NO
- 3.1 If yes, furnish particulars
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Employer

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Witness 1

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Witness 2

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Contractor

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Witness 1

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Witness 2



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4. Will any portion of goods or services be sourced from outside the Republic, and, if so, what portion of payment from the municipality / municipal entity is expected to be transferred out of the Republic?
[TICK APPLICABLE BOX] ☐ *YES / ☐ NO
- 4.1 If yes, furnish particulars

.....

.....

CERTIFICATION

I, THE UNDERSIGNED (FULL NAME)

CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS 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.

.....
Name/s and Surname of Bidder

.....
Signature

.....
Position in the Firm/Company

.....
Date

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



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T2.2.18:

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**

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

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:

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Employer

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Witness 1

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Witness 2

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Contractor

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Witness 1

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Witness 2



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	POINTS
PRICE	90
SPECIFIC GOALS	10
Total points for Price and SPECIFIC GOALS	100

- 1.5 Failure on the part of a tenderer to submit proof or documentation required in terms of this tender to claim points for specific goals with the tender, will be interpreted to mean that preference points for specific goals are not claimed.
- 1.6 The organ of state reserves the right to require of a tenderer, either before a tender is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the organ of state.

2. DEFINITIONS

- (a) **“tender”** means a written offer in the form determined by an organ of state in response to an invitation to provide goods or services through price quotations, competitive tendering process or any other method envisaged in legislation;
- (b) **“price”** means an amount of money tendered for goods or services, and includes all applicable taxes less all unconditional discounts;
- (c) **“rand value”** means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes;
- (d) **“tender for income-generating contracts”** means a written offer in the form determined by an organ of state in response to an invitation for the origination of income-generating contracts through any method envisaged in legislation that will result in a legal agreement between the organ of state and a third party that produces revenue for the organ of state, and includes, but is not limited to, leasing and disposal of assets and concession contracts, excluding direct sales and disposal of assets through public auctions; and
- (e) **“the Act”** means the Preferential Procurement Policy Framework Act, 2000 (Act No. 5 of 2000).

Employer

Witness 1

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Contractor

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3. FORMULAE FOR PROCUREMENT OF GOODS AND SERVICES

3.1. POINTS AWARDED FOR PRICE

3.1.1 THE 90/10 PREFERENCE POINT SYSTEMS

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

90/10

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

Where

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

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

3.2.1. POINTS AWARDED FOR PRICE

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

90/10

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

Where

Ps = Points scored for price of tender under consideration
Pt = Price of tender under consideration
Pmax = Price of highest acceptable tender

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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.

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

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

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

The specific goals allocated points in terms of this tender	Number of points allocated (90/10 system) (To be completed by the organ of state)	Number of points allocated (80/20 system) (To be completed by the organ of state)	Number of points claimed (90/10 system) (To be completed by the tenderer)	Number of points claimed (80/20 system) (To be completed by the tenderer)
Ownership	Points	Points	Points claimed	Points claimed
Rustenburg Jurisdiction	2	4		
Rural /Township Businesses	2	4		
Black People	1	2		
Persons with Disability	1	2		
Youth	2	4		
Women	1	2		
SMME's	1	2		
Total	10	20		

Proof of address as envisaged on the list of mandatory documents and a full Central Supplier Database full report will be used for verification and allocation of points.

Employer

Witness 1

Witness 2

Contractor

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DECLARATION WITH REGARD TO COMPANY/FIRM

4.3. Name of company/firm.....

4.4. Company registration number:

4.5. TYPE OF COMPANY/ FIRM [TICK APPLICABLE BOX]

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

4.6. 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

[Signature Box]
Employer

[Signature Box]
Witness 1

[Signature Box]
Witness 2

[Signature Box]
Contractor

[Signature Box]
Witness 1

[Signature Box]
Witness 2



RUSTENBURG LOCAL MUNICIPALITY
BID NO: RLM/OMM/0091/2022/23
APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG
WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER
RETICULATION SYSTEM - PHASE D

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

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

Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

CONTRACT FORM - RENDERING OF SERVICES

MDB 7.2

THIS FORM MUST BE FILLED IN DUPLICATE BY BOTH THE SERVICE PROVIDER (PART 1) AND THE PURCHASER (PART 2). BOTH FORMS MUST BE SIGNED IN THE ORIGINAL SO THAT THE SERVICE PROVIDER AND THE PURCHASER WOULD BE IN POSSESSION OF ORIGINALLY SIGNED CONTRACTS FOR THEIR RESPECTIVE RECORDS.

PART 1 (TO BE FILLED IN BY THE SERVICE PROVIDER)

I hereby undertake to render services described in the attached bidding documents to (name of the institution)in accordance with the requirements and task directives / proposals specifications stipulated in Bid Number..... at the price/s quoted. My offer/s remain binding upon me and open for acceptance by the Purchaser during the validity period indicated and calculated from the closing date of the bid.

The following documents shall be deemed to form and be read and construed as part of this agreement:

Bidding documents,

Invitation to bid;

Tax compliance status (CSD report);

Pricing schedule(s);

Filled in task directive/proposal;

Preference claims for Broad Based Black Economic Empowerment Status Level of Contribution in terms of the Preferential Procurement Regulations 2022;

Declaration of interest;

Declaration of bidder's past SCM practices;

Certificate of Independent Bid Determination;

Special Conditions of Contract;

General Conditions of Contract; and

Other (specify)

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY
BID NO: RLM/OMM/0091/2022/23
APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG
WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER
RETICULATION SYSTEM - PHASE D

I confirm that I have satisfied myself as to the correctness and validity of my bid; that the price(s) and rate(s) quoted cover all the services specified in the bidding documents; that the price(s) and rate(s) cover all my obligations and I accept that any mistakes regarding price(s) and rate(s) and calculations will be at my own risk.

I accept full responsibility for the proper execution and fulfilment of all obligations and conditions devolving on me under this agreement as the principal liable for the due fulfillment of this contract.

I declare that I have no participation in any collusive practices with any bidder or any other person regarding this or any other bid.

I confirm that I am duly authorised to sign this contract.

NAME (PRINT)

CAPACITY

SIGNATURE

NAME OF FIRM

DATE

WITNESSES

1

2

DATE:

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

MBD 7.2

CONTRACT FORM - RENDERING OF SERVICES

PART 2 (TO BE FILLED IN BY THE PURCHASER)

I..... in my capacity as.....
accept your bid under reference numberdated.....for the rendering of services indicated
hereunder and/or further specified in the annexure(s).

An official order indicating service delivery instructions is forthcoming.

I undertake to make payment for the services rendered in accordance with the terms and conditions of the contract,
within 30 (thirty) days after receipt of an invoice.

DESCRIPTION OF SERVICE	PRICE (ALL APPLICABLE TAXES INCLUDED)	COMPLETION DATE	MINIMUM THRESHOLD FOR LOCAL PRODUCTION AND CONTENT (if applicable)

4. I confirm that I am duly authorized to sign this contract.

SIGNED ATON.....

NAME (PRINT)

SIGNATURE

WITNESSES

1

2

DATE:

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY
BID NO: RLM/OMM/0091/2022/23
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RETICULATION SYSTEM - PHASE D

MBD 8: DECLARATION OF ABUSE OF SUPPLY CHAIN MANAGEMENT SYSTEM

DECLARATION OF BIDDER'S PAST SUPPLY CHAIN MANAGEMENT PRACTICES

- 1 This Standard Bidding Document must form part of all bids invited.
- 2 It serves as a declaration to be used by institutions 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 disregarded if that bidder, or any of its directors have-
 - a. abused the institution's supply chain management system.
 - b. committed fraud or any other improper conduct in relation to such system; or
 - c. failed to perform on any previous contract.
- 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 of Restricted Suppliers as companies or persons prohibited from doing business with the public sector? Companies or persons who are listed on this Database were informed in writing of this restriction by the Accounting Officer/Authority of the institution that imposed the restriction after the <i>audi alteram partem</i> rule was applied). The Database of Restricted Suppliers now resides on the National Treasury's website (www.treasury.gov.za) and can be accessed by clicking on its link at the bottom of the home page.	Yes ☐	No ☐
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)? The Register for Tender Defaulters can be accessed on the National Treasury's website (www.treasury.gov.za) by clicking on its link at the bottom of the home page.	Yes ☐	No ☐
4.2.1	If so, furnish particulars: _____		
4.3	Was the bidder or any of its directors convicted by a court of law (including a court outside of the Republic of South Africa) for fraud or corruption during the past five years?	Yes ☐	No ☐

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY
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RETICULATION SYSTEM - PHASE D

4.3.1	If so, furnish particulars: 		
4.4	Was any contract between the bidder and any organ of state terminated during the past five years on account of failure to perform on or comply with the contract?	Yes ☐	No ☐
4.4.1	If so, furnish particulars: 		

CERTIFICATION

I, THE UNDERSIGNED (FULL NAME)CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS 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.

..... Name/s and surname of Bidder	 Signature
..... Position In the Firm/Company	 Date

Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2



RUSTENBURG LOCAL MUNICIPALITY
BID NO: RLM/OMM/0091/2022/23
APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG
WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER
RETICULATION SYSTEM - PHASE D

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

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY
BID NO: RLM/OMM/0091/2022/23
APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG
WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER
RETICULATION SYSTEM - PHASE D

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

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY
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RETICULATION SYSTEM - PHASE D

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)
 - (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.
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.

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.

.....
Signature

.....
Date

.....
Position

.....
Name of Bidder

--

Employer

--

Witness 1

--

Witness 2

--

Contractor

--

Witness 1

--

Witness 2



RUSTENBURG LOCAL MUNICIPALITY
BID NO: RLM/OMM/0091/2022/23
APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG
WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER
RETICULATION SYSTEM - PHASE D

SECTION 38: DECLARATION FORM

T2.2.22:

Having examined the BID and the general conditions thereto, I/we hereby certify that the bid price in the bid schedules and the preference points claimed are correct.

I/We furthermore certify that I/we/the Company comply/complies with the issues around Section 38 of the Supply Chain Management Policy inter alia:

IF ALL IS IN PLACE IN RESPECT OF THE CONTRACTUAL ISSUES LISTED IN THE TABLE BELOW; THE ANSWER SHOULD BE YES. ATTACH SUPPORTING INFORMATION IF ANY OF THE ANSWERS IS NO.

Note that the Municipality's Procurement Section will verify the statements.

I/we certify the following:

No.	CONTRACTUAL ISSUES	YES	NO
1.	In terms of Section 38 (1) (c) that the Bidder or any of the Directors is not listed as a person prohibited from doing business with the Public Sector		
2.	In terms of Section 38 (1)(d) (i) that the Bidder or any of the Directors does not owe rates and taxes or Municipal service charges to any Municipality that is in any arrears for more than three (3) months. Copies of the latest Municipal service charges statement of the Bidder and the Directors must be attached to the tender/bid document		
3.	In terms of Section 38 (1) (d) (ii) that the Bidder or any of the Directors has not failed to perform satisfactorily on a previous/previous contract/s with the Municipality or any organ of state		
4.	In terms of Section 38 (i) (9) that the Bidder or any of the Directors has not been convicted for fraud or corruption during the past five (5) years		
5.	In terms of Section 38 (i) (9) (iv) that the Bidder or any of the Directors has not been listed in the Register Of Tender Defaulters in terms of Section 29 of the Prevention and Combating of Corrupt Activities Act, (Act No. 12 of 2004)		

.....
SIGNATURE OF BIDDER

.....
DATE

.....
FULL NAME AND SURNAME OF BIDDER IN BLOCK LETTERS

COMPANY NAME:

PHYSICAL ADDRESS:

TELEPHONE NUMBER:

EMAIL ADDRESS:

WITNESS 1: WITNESS 2:

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

THE CONTRACT PART C1: AGREEMENTS AND CONTRACT DATA

- C1.1** **Form of Offer and Acceptance**
- C1.2** **Contract Data**
- C1.3** **Pro Forma Guarantee**

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

C1.1 Form of Offer and Acceptance

THE CONTRACT
Part C1: Agreement and Contract Data

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C1.1
Form of Offer and Acceptance

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

Offer

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

BID No. RLM/OMM/0091/2022/23 APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

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

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

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

..... Rand (in words); R
..... (in figures)

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

Signature Date

Name

Capacity

for the tenderer

(Name and
address of
organization)

Name and
signature
of witness

Acceptance

THE CONTRACT
Part C1: Agreement and Contract Data

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C1.1
Form of Offer and Acceptance

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

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

The terms of the contract, are contained in:

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

and drawings and documents or parts thereof, which may be incorporated by reference into Parts 1 to 4 above.

Deviations from and amendments to the documents listed in the tender data and any addenda thereto as 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 (whose details are given in the contract data) to arrange the delivery of any 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 fulfill 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 working 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.

Signature Date

Name

Capacity

**for the
Employer** Rustenburg Local Municipality
Missionary Mpheni House
c/o Beyers Naude & Nelson Mandela Drive
Rustenburg

Name and Date.....

THE CONTRACT Part C1: Agreement and Contract Data

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C1.1 Form of Offer and Acceptance

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

signature
of witness

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 Conditions of Tender;
2. A Tenderer's covering letter shall not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid become the subject of agreements reached during the process of, offer and acceptance, the outcome of such agreement shall be recorded here;
3. Any other matter arising from the process of offer and acceptance either as a confirmation, clarification or change to the tender documents and which it is agreed by the Parties becomes an obligation of the contract shall also be recorded here;
4. Any change or addition to the tender documents arising from the above agreements and recorded here, shall also be incorporated into the final draft of the Contract.

1 Subject

Details

.....
.....

2 Subject

Details

.....
.....

3 Subject

Details

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

4 Subject

Details

.....
.....

THE CONTRACT
Part C1: Agreement and Contract Data

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C1.1
Form of Offer and Acceptance

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

.....
5 Subject

Details

.....

.....

.....

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

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

for the tenderer

Signature Date

Name

Capacity

(Name and
address of
organization)

Name and
signature
of witness

for the Employer

Signature Date

Name

Capacity

Rustenburg Local Municipality
Missionary Mpheni House
c/o Beyers Naude & Nelson Mandela Drive

THE CONTRACT
Part C1: Agreement and Contract Data

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C1.1
Form of Offer and Acceptance

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

Rustenburg

Name and
signature
of witness

Date.

THE CONTRACT
Part C1: Agreement and Contract Data

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C1.1
Form of Offer and Acceptance

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

C1.2 Contract Data

GENERAL CONDITIONS OF CONTRACT

The General Conditions of Contract for Construction Works (2015) 3rd Edition, published by the South African Institution of Civil Engineering, is applicable to this Contract.

The General Conditions of Contract are not bound into this document but are available at the Contractor's expense. Each party to the contract shall purchase its own copy of the GC 2015, available from
South African Institution of Civil Engineering
Private Bag X200
Halfway House, 1685
South Africa
Tel: 27(0) 11 805 5947 /48 /53

Each item of data below is cross-referenced to the clause in the conditions of contract to which it applies.

In terms of clause 1.1.1.8 of the General Conditions of Contract for Construction Works (2015) 3rd Edition, published by the South African Institution of Civil Engineering, the following Contract Data apply 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	Replace the contents of Clause 1.1.1.5 with the following: The "Commencement Date" means the date on which the contractor receives a written instruction from the Employer to commence with the Works. The instruction to commence with the works will not be issued later than 28 days from the date that the Agreement made in terms of the Form of Offer and Acceptance comes into effect.
1.1.1.13	The Defects Liability Period for the Works shall be 365 days.
1.1.1.14	Add the following to the end of this definition: This clause shall apply <i>mutatis mutandis</i> to any portion or phase of the Works that may be described in the Scope of Works or in the Contract Data, or agreed subsequently between the Contractor and the Employer, and committed to writing. The time for achieving practical completion 18 Months .
1.1.1.15	The Employer is Rustenburg Local Municipality.
1.1.1.16	The Engineer means any Director, Associate or Professional Engineer appointed generally or specifically by the management of the Employer to fulfil the functions of the Engineer in terms of the Conditions of Contract.
1.1.1.26	The pricing strategy is Re-measurement Contract.

THE CONTRACT Part C1: Agreement and Contract Data

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C1.2 Contract Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

Clause	Contract Data
1.2.1	Add the following to the clause: 1.2.1.3 Sent by facsimile, electronic or any like communication irrespective of it being during office hours or otherwise. 1.2.1.4 Posted to the Contractor's address and delivered by the postal authorities. 1.2.1.5 Delivered by a courier service and signed for by the recipient or his representative.
1.2.1.2	The address of the Employer is: Rustenburg Local Municipality C/o Beyers Naudé & Nelson Mandela Drive P O Box 550 Rustenburg 0300 Tel: +27 (14) 590 3098 Fax: +27 (14) 590 3879
1.3.6	Add the following new Clause: The copyright in all documents, drawings and records (prepared by the Engineer) related in any manner to the Works shall vest in the Employer or the Engineer or both (according to the dictates of the Contract that has been entered into by the Engineer and the Employer for the Works), and the Contractor shall not furnish any information in connection with the Works to any person or organisation without the prior approval of the Employer to this effect.
3.1.3	The Engineer is, in terms of his appointment by the Employer for the design and administration of the Works included in the Contract, required to obtain the specific approval of the Employer for the execution of the following duties: 3.1.3.1 The issuing of an order to suspend the progress of the Works, the extra cost resulting from which order is to be borne by the Employer in terms of Clause 5.11 or the effect of which is liable to give rise to a claim by the Contractor for an extension of time under Clause 5.12 of these conditions. 3.1.3.2 The issuing of an instruction or order to vary the nature or quantity of the Works in terms of Clause 6.3, the estimated effect of which will be to increase the Contract Price by an amount exceeding R50 000, the evaluation of all variation orders in terms of Clause 6.4 and the adjustment of the sum(s) tendered for General Items in terms of Clause 6.11. 3.1.3.3 The approval of any claim submitted by the Contractor in terms of Clause 10.1.
4.1.2	Add the following to the clause: The Contractor shall provide the following to the Engineer for retention by the Employer or his assignee in respect of all works designed by the Contractor: 4.1.2.1 a Certificate of Stability of the Works signed by a registered Professional Engineer confirming that all such works have been designed in accordance with the appropriate codes of practice. 4.1.2.2 proof of registration and of adequate and current professional indemnity insurance cover held by

THE CONTRACT Part C1: Agreement and Contract Data

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C1.2 Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

Clause	Contract Data
	the designer(s). 4.1.2.3 design calculations should the Engineer request a copy thereof. 4.1.2.4 engineering drawings and workshop details (both signed by the relevant professional engineer), in order to allow the Engineer to compare the design with the specified requirements and to record any comments he may have with respect thereto. 4.1.2.5 "As-Built" drawings in DXF electronic format after completion of the Works. The Contractor shall be responsible for the design of the Temporary Works.
4.3.3	Add the following new clause: The Contractor shall comply with the Occupational Health and Safety Specification prepared by the Employer in terms of the Construction Regulations, 2003 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 before commencement of the Works or any part thereof, be in the possession of an approved Health and Safety Plan. The Contractor shall submit an approved Health and Safety Plan to the Engineer within 14 days from the date that the Agreement made in terms of the Form of Offer and Acceptance comes into effect.
4.3.4	Add the following new clause: Contractor's liability as mandatory Notwithstanding any actions which the Employer may take, the Contractor accepts sole liability for due compliance with the relevant duties, obligations, prohibitions, arrangements and procedures imposed by the Occupational Health and Safety Act, 1993 (Act 85 of 1993), and all its regulations, including the Construction Regulations, 2003, for which he is liable as mandatory. By entering into this Contract, it shall be deemed that the parties have agreed in writing to the above provisions in terms of Section 37 (2) of the Act.
4.3.5	Add the following new clause: Contractor to notify Employer The Employer retains an interest in all inquiries conducted under this Contract in terms of Section 31 and/or 32 of the Occupational Health and Safety Act, 1993 (Act 85 of 1993) and its Regulations following any incident involving the Contractor and/or Sub-Contractor and/or their employees. The Contractor shall notify the Employer in writing of all investigations, complaints or criminal charges which may arise pursuant to work performed under this Contract in terms of the Occupational Health and Safety Act, 1993 (Act 85 of 1993) and Regulations.
4.3.6	Add the following new clause: Contractor's Designer The Contractor and his designer shall accept full responsibility and liability to comply with the Occupational Health and Safety Act, 1993 (Act 85 of 1993) and the Construction Regulations, 2003 for the design of the Temporary Works and those part of the Permanent Works which the Contractor is responsible to design in terms of the Contract.

THE CONTRACT
Part C1: Agreement and Contract Data

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C1.2
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

Clause	Contract Data
4.3.7	Add the following new clause: The Ministerial Determination 4, Expanded Public Works Programmes, issued in terms of the Basic Conditions of Employment Act of 1997 by the Minister of Labour in Government Notice No 949 of 22 October 2010, as appended to these Contract Data as Annexure A, shall apply to works described in the Scope of Work as being labour intensive and which are undertaken by unskilled or semi-skilled workers.
4.10.3	Add the following new clause: The Contractor shall use local labour in accordance with the requirements contained within the Scope of Work.
5.3.1	Add the following: The documentation required before commencement with Works Execution are: • Health and Safety Plan (Refer to Clause 4.3) • Initial Programme (Refer to Clause 5.6) • A detailed cash flow forecast (Refer to Clause 5.6.2.6) • Security (Refer to Clause 6.2) • Insurance (Refer to Clause 8.6)
5.3.2	Add the following: The time to submit the documentation required (Refer to Clause 5.3.1) before commencement with Works execution is 14 days.
5.4.2	The access and possession of Site shall not be exclusive to the Contractor but as set out in the Scope or Works and/or Site information.
5.6.1	Add the following to the clause: In this regard the Contractor shall have regard for the phases and sub-phases (if applicable) for the Development, which shall also be the order in which the Permanent Works shall be constructed, unless otherwise agreed between the parties and committed to writing. If phased construction is applicable, the phases and sub-phases will be described in the Specifications and/or will be indicated on the Phasing Plan which forms part of the Drawings.
5.7.1	Delete the last paragraph of the clause and replace with the following: No such instruction by the Engineer to expedite progress shall be the subject of additional compensation to the Contractor unless the instruction explicitly states that the Contractor is entitled to additional compensation, and cites the amount of such compensation or the basis upon which it is to be determined.
5.8.1	The non-working days are Sundays. Special non-working days shall be all South African Statutory holidays and the official building holidays (which commences on 16 December and ends on 10 January).

THE CONTRACT
Part C1: Agreement and Contract Data

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C1.2
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

Clause	Contract Data
5.12.3	Delete the contents of the clause and insert the following: If an extension of time is granted, other than an extension resulting from abnormal rainfall in terms of Clause 5.12.5, the Contractor shall be paid such additional time-related General Items as are appropriate having regard to any other compensation which may already have been granted in respect of the circumstances concerned.
5.12.5	Add the following new clause: Extension of time due to Abnormal Rainfall Extension of time for completion of the Contract shall be allowed in the event of abnormal rainfall in accordance with the following formula: $V = (N_w - N_n) + (R_w - R_n)/20$ Where: V = Extension of time in calendar days for the calendar month under consideration N_w = Actual number of days during the calendar month under consideration on which a rainfall of 10mm and more is recorded R_w = Actual total rainfall in mm recorded during the calendar month under consideration N_n = Average number of days, derived from rainfall records, on which a rainfall of 10mm and more was recorded during the relevant calendar month as per the data tabulated hereinafter R_n = Average total rainfall in mm for the relevant calendar month, derived from rainfall records, as tabulated hereinafter Where the extension of time due to abnormal rainfall has to be calculated for portion of a calendar month, pro rata values shall be used. Should V be negative for any particular month, and should its absolute value exceed the corresponding value of N_n, then V shall be taken as being equal to minus N_n. The total extension of time to be granted shall be the algebraic sum of all the monthly extensions, provided that if this total is negative then the time for completion shall not be reduced due to subnormal rainfall. Rainfall records for the period of construction shall be taken on Site. The Contractor shall provide and install all the necessary equipment for accurately measuring the rainfall. The Contractor shall also provide, erect and maintain a security fence plus gate, padlock and keys at each measuring station, all at his own cost. The Engineer or his Representative shall take and record the daily rainfall readings. The Contractor shall be permitted to attend these readings, in the company of the Engineer's Representative. Access to the measuring gauge(s) shall at all times be under the Engineer's control. The rainfall records applicable to this Contract are those recorded at Weather Station Rustenburg ARG 0511/5234. The following values of N_n and R_n shall apply:

THE CONTRACT
Part C1: Agreement and Contract Data

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C1.2
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

Clause	Contract Data																																										
	<table><tr><th>Month</th><th>R_n (mm)</th><th>N_n (days)</th></tr><tr><td>January</td><td>130,1</td><td>4</td></tr><tr><td>February</td><td>94,2</td><td>3</td></tr><tr><td>March</td><td>75,1</td><td>2</td></tr><tr><td>April</td><td>60,3</td><td>2</td></tr><tr><td>May</td><td>9,8</td><td>0</td></tr><tr><td>June</td><td>5,9</td><td>0</td></tr><tr><td>July</td><td>1,6</td><td>0</td></tr><tr><td>August</td><td>7,2</td><td>0</td></tr><tr><td>September</td><td>18,8</td><td>0</td></tr><tr><td>October</td><td>57,5</td><td>2</td></tr><tr><td>November</td><td>89,4</td><td>3</td></tr><tr><td>December</td><td>105,8</td><td>3</td></tr><tr><td>TOTAL</td><td>655,7</td><td>19</td></tr></table> No adjustment to the total for time-related preliminary and general items will be applicable for any automatic extension of time for completion granted in terms of this clause.	Month	R _n (mm)	N _n (days)	January	130,1	4	February	94,2	3	March	75,1	2	April	60,3	2	May	9,8	0	June	5,9	0	July	1,6	0	August	7,2	0	September	18,8	0	October	57,5	2	November	89,4	3	December	105,8	3	TOTAL	655,7	19
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November	89,4	3																																									
December	105,8	3																																									
TOTAL	655,7	19																																									
5.13.	Delete the contents of the clause and insert the following: 5.13.1 If the Contractor fails by the Due Completion Date to complete the Works, or any specific portion thereof that is identified in the Scope of Works to the extent which entitles him in terms of Clause 5.14.2 to receive a Certificate of Practical Completion for the Works, then the Contractor shall be liable to the Employer for the sum(s) stated below as (a) penalty(ies) for every day which shall elapse between the Due Completion Date for the Works or the specific portion of the Works and the actual Date of Practical Completion of the Works or of the specific portion. The penalty for delay shall be: R3000-00 per calendar day. 5.13.2 If before the issue of a Certificate of Practical Completion for the whole of the Works, or for any specific portion thereof that is identified in the Scope of Works, any further part of the Works has been: 5.13.2.1 certified as complete in terms of a Certificate of Practical Completion; or 5.13.2.2 occupied or used by the Employer, his agents, employees or other contractors (not being employed by the Contractor); then the appropriate penalty for delay referred to in Clause 5.13.1 above shall be reduced by the amount which is determined by the Engineer to be appropriate under the circumstances. 5.13.3 The imposition of penalties in terms of Clause 5.13.1 shall not relieve the Contractor from his obligation to complete the Works, nor from any of his obligations and liabilities under the Contract. 5.13.4 All penalties for which the Contractor becomes liable in terms of Clause 5.13.1 shall be accumulative. The Employer may, without prejudice to any other method of recovery, deduct the amounts of all such penalties from any monies in his possession that are or may become due to the Contractor.																																										

THE CONTRACT

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C1.2

Part C1: Agreement and Contract Data

Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

Clause	Contract Data
	5.13.5 The imposition of any penalties in terms of Clause 5.13.1 shall not limit the right of the Engineer of the Employer to act in terms of Clause 9.2.
5.13.4	Add the following new Clause: If the Contractor shall, without the prior written permission of the Engineer, in respect of any portions of the Works which are prescribed in the Scope of Work to be executed using labour intensive construction methods, or for which the maximum size and capacity of mechanical plant and equipment is restricted in terms of the Contract: - fail to execute such portions of the Works, or any parts thereof, utilising labour-intensive construction methods strictly in accordance with the provisions of the Contract; or - utilise in the execution of such portions of the Works, or any parts thereof, mechanical plant or equipment which is in conflict with the terms of the Contract; or - utilise in the execution of such portions of the Work, workers drawn from sources other than those allowed in terms of the Contract. then the Contractor shall be liable to the Employer for the percentage stated below of the value of the Works so executed in conflict with the provisions of the relevant Scope of Work, as a penalty for non-compliance. The penalty for non-compliance is: 15% of the value of Works specified. The imposition of penalties in terms of this clause shall not relieve the Contractor from his obligation to complete the Works, nor from any of his obligations and liabilities under the Contract.
5.16.3	The Latent defect period is 10 years after the issue of the Final Approval Certificate in terms of Clause 15.6.1
6.1.1	Add the following to the clause: Payment for works identified in the Scope of Work as being labour-intensive shall only be made in accordance with the provisions of the Contract if the works are constructed strictly in accordance with the provisions of the Scope of Work. Any non-payment for such works shall not relieve the Contractor in any way from his obligations either in contract or in delict.
6.2.1	Add the following to this Clause: The amount of the Surety will be 10% of the Contract Price (including Value Added Tax) at the time that the Agreement comes into effect. The guarantee shall remain valid until the issue of the Certificate or Certificates of Completion in respect of the whole of the Permanent Works. The Pro Forma Form of Guarantee bound into the General Conditions of Contract is replaced by the Form of Guarantee (Deed of Surety ship) which is included in Part C1.3 of this document. This approval or otherwise shall be based upon legal opinion to be provided by the Engineer.
6.8.2	The application of a Contract Price Adjustment factor will not apply to this Contract. "Refer to Contract Price Adjustment Schedule for details".
6.8.3	Price Adjustments for variations in the cost of special materials will be allowed. "The Contractor will be required to provide full details in Part 2 of the Contract Data".

THE CONTRACT
Part C1: Agreement and Contract Data

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C1.2
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

Clause	Contract Data
6.8.4	In line 8 delete the words "between the Employer and the Contractor".
6.10.1.5	The percentage advance on materials not yet built into the Permanent Works is 80%.
6.10.3	The percentage retention 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	In line 4 delete the word "said" and insert the word "correct".
6.10.9	Replace the first sentence of the clause with the following: Within 14 days after the date of final approval as stated in the Final Approval Certificate, the Contractor shall deliver to the Engineer a final statement claiming final statement of all moneys due to him for additional work ordered by the Engineer after the Certificate of Completion date (save in respect of matters in dispute, in terms of Clause 58, and not yet resolved) plus the remainder of retention monies (subject to Clause 49.5.1) retained by the Employer.
6.11.1.3	Delete "15 %" and replace it with "25%".
8.6.1.3	The limit of indemnity for liability insurance is R5 000 000 per event, the number of events being unlimited.
10.5.3	The number of Adjudication Board Members to be appointed is 1 (One).

THE CONTRACT
Part C1: Agreement and Contract Data

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C1.2
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

CONTRACT PRICE ADJUSTMENT SCHEDULE	
Clause	Contract Data
1.1	The application of a Contract Price Adjustment factor will not apply to this Contract. The price adjustment formula provided in the General Conditions of Contract will apply, together with the following coefficients and the definition of the relevant indices indicated below; X=0,10 a=0.15 b=0.20 c=0.55 d=0.1
1.2	Replace the definitions of the relevant indices with the following: "L" is the "Labour Index" and shall be the "Consumer Price Index" as published in the Consumer Price Index Statistical Release P0141 (Table A – Consumer Price Index and percentage change according to Rustenburg of Statistics South Africa. "P" is the "Plant Index" and shall be the "Civil Engineering Plant" index as published in the Production Price Index Statistical Release P0142.1 (Table 12 – Price Index for selected materials) of Statistics South Africa. "M" is the "Materials Index" and shall be the "Civil Engineering" index as published in the Production Price Index Statistical Release P0142.1 (Table 11 – Production Price for materials used in certain industries) of Statistics South Africa. "F" is the "Fuel Index" and shall be the "Diesel fuel – Coast and Witwatersrand" index as published in the Production Price Index Statistical Release P0142.1 (Table 12 - Production Price Index for selected materials) of Statistics South Africa.
1.3	The base month shall be the month prior to the closing date of this tender.

THE CONTRACT
Part C1: Agreement and Contract Data

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C1.2
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

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 address of the Contractor is: 												
6.2.1	The security to be provided by the Contractor shall be one of the following: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr style="background-color: #d3d3d3;"> <th style="width: 70%;">Type of Security</th><th style="width: 30%;">Contractor's choice. Indicate "Yes" or "No"</th></tr> </thead> <tbody> <tr> <td>Cash deposit of 10% of the Contract Sum (Incl. VAT).</td><td></td></tr> <tr> <td>Performance guarantee of 10 % of the Contract Sum (Incl. VAT).</td><td></td></tr> <tr> <td>Retention of 10% of the value of the Works (Incl. VAT).</td><td></td></tr> <tr> <td>Cash deposit of 5% of the Contract Sum (Incl. VAT) plus retention of 5% of the value of the Works (Incl. VAT).</td><td></td></tr> <tr> <td>Performance guarantee of 5% of the Contract Sum (Incl. VAT) plus retention of 5% of the value of the Works (Incl. VAT).</td><td></td></tr> </tbody> </table>	Type of Security	Contractor's choice. Indicate "Yes" or "No"	Cash deposit of 10% of the Contract Sum (Incl. VAT).		Performance guarantee of 10 % of the Contract Sum (Incl. VAT).		Retention of 10% of the value of the Works (Incl. VAT).		Cash deposit of 5% of the Contract Sum (Incl. VAT) plus retention of 5% of the value of the Works (Incl. VAT).		Performance guarantee of 5% of the Contract Sum (Incl. VAT) plus retention of 5% of the value of the Works (Incl. VAT).	
Type of Security	Contractor's choice. Indicate "Yes" or "No"												
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Retention of 10% of the value of the Works (Incl. VAT).													
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Performance guarantee of 5% of the Contract Sum (Incl. VAT) plus retention of 5% of the value of the Works (Incl. VAT).													
6.8.3	The variation in cost of special materials is: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr style="background-color: #d3d3d3;"> <th style="width: 33%;">Special Material</th><th style="width: 33%;">Method</th><th style="width: 34%;">Price for Base Month</th></tr> </thead> <tbody> <tr> <td style="height: 30px;"></td><td></td><td></td></tr> </tbody> </table>	Special Material	Method	Price for Base Month									
Special Material	Method	Price for Base Month											

END OF SECTION

THE CONTRACT
Part C1: Agreement and Contract Data

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C1.2
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

C1.3. Pro forma Performance guarantee

Contract No RLM/ OMM/0091/2022/23

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

GUARANTOR DETAILS AND DEFINITIONS

"Guarantor" means:

Physical address:

"Employer" means:

"Contractor" means:

"Engineer" 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

Amount in Words

"Expiry Date" means:

CONTRACT DETAILS

Engineer issues: Interim Payment Certificates, Final Payment Certificate and the Certificate Completion of the Works as defined in the Contract.

THE CONTRACT Part C1: Agreement and Contract Data

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C1.3 Contract Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

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 issue by the Engineer of the Certificate of Completion of the Works or the date of payment in full of the Guaranteed sum, whichever occurs first. The Engineer and/or the Employer shall advise the Guarantor in writing of the date on which the Certificate of Completion of the Works 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 Engineer 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) 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 receipts 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 term 1.
7. Where the Guarantor has made payment in term 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 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 Employer.
9. Payment by the Guarantor in terms of 5 will only be made against the return of the original Performance Guarantee by the Employer.
10. 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.

THE CONTRACT

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C1.3

Part C1: Agreement and Contract Data

Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

11. The Guarantor chooses the physical address as stated above for the services of all notices for all purposes in connection herewith.
12. This Performance Guarantee is neither negotiable nor transferable and shall expire in terms of 2, where after no claims will be considered by the Guarantor after it has expired.
13. 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.
14. 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).....

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C1.3 Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

C1.4. Other Schedules and Documents (Technical Data Sheets)

Details of the plant and equipment offered are to be supplied on the data sheets and must be completed by the tenderer. Alternatively, all relevant information can be supplied in a covering letter accompanying the tender documents.

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C1.3
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

MECHANICAL TECHNICAL DATA SHEETS

TECHNICAL DATA SHEET NO 1				
FINE MECHANICAL SCREENS				
AREA: INLET WORKS				
No	Item	Unit	Specified	Offered
1.	SCREEN DETAILS			
1.1	Manufacturer			
1.2	Model			
1.3	Screen Type		Inclined front multi-rake chain drive	
1.4	Channel width	mm	400	
1.5	Channel depth	mm	800	
1.6	Screen width ID	mm		
1.7	Approx. Screen length	mm		
1.8	Max. flow height			
1.9	Hydraulic flow	ML/day	10	
1.10	Screen field length	m		
1.11	Screen field taper bars	mm	304 s/s taper 40x8 reduced to 4mm	
1.12	Top sprocket type & material		FV112 /304 s/s	
1.13	Bottom chain support type & material		UHDPE / 304 s/s	
1.14	Chain type & material		FV112 /304 s/s	
1.15	Screen bar spacing	mm	8	
1.16	Discharge above floor level	mm		
1.17	Discharge chute material		304 s/s, 4.5 mm thick	
1.18	Main guide frame material		304 s/s, 4.5 mm thick	

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C1.3
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

2.	DRIVE UNIT DETAILS			
2.1	Manufacturer of Motor			
2.2	Motor size	kW		
2.3	Rotational speed	rpm		
2.4	Make of gearbox			
2.5	Reduction ratio			
2.6	Ingress Protection on motor		IP 55	
2.7	Motor type of starter		DOL	
2.8	Power factor at duty point		>0.86	
2.9	Thermal protection fitted		Over temp cut-out	
2.10	Motor heater fitted	Yes/No	Yes	

.....
SIGNATURE OF TENDERER

.....
DATE

THE CONTRACT
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C1.2
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

TECHNICAL DATA SHEET NO 2
SCREENINGS COMPACTOR
AREA: INLET WORKS

No	Item	Unit	Specified	Offered
1.	COMPACTOR DETAILS			
1.1	Manufacturer			
1.2	Model			
1.3	Compactor Type		Screw press washer	
1.4	Compactor Tube diameter	mm	200	
1.5	Compactor Tube length	mm		
1.6	Compacting screw material		Mild steel EN8 hard faced	
1.7	Screenings receiving chute dimensions.	mm	1200 long x 800 mm wide	
1.8	Dry screenings discharge rate	m ³ /h		
1.9	Max. moisture content at discharge	%	20	
1.10	Press orientation		horizontal	
1.11	Discharge tube diameter	mm	200 conical	
1.12	Discharge tube orientation	deg		
1.13	Discharge tube length	mm		
1.14	Discharge height above compactor	mm		
1.15	Wash water spray bars	No	1	
1.16	Wash water spray nozzles	No		
1.17	Draining pipe diameter	mm	100 NB	

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C1.2
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

2.	DRIVE UNIT DETAILS			
2.1	Manufacturer of Motor			
2.2	Motor size	kW		
2.3	Rotational speed	rpm		
2.4	Make of gearbox			
2.5	Reduction ratio			
2.6	Ingress Protection on motor		IP 55	
2.7	Motor type of starter		DOL	
2.8	Power factor at duty point		>0.86	
2.9	Thermal protection fitted		Over temp cut-out	
2.10	Motor heater fitted	(Yes/No)	Yes	

.....
SIGNATURE OF TENDERER

.....
DATE

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C1.2
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

TECHNICAL DATA SHEET NO 3				
SPIRAL CONVEYOR				
AREA: INLET				
No	Item	Unit	Specified	Offered
1.	DEVICE DETAILS			
1.1	Manufacturer			
1.2	Type		Centreless Spiral	
1.3	Method of fixing to concrete		Wedge anchors	
1.4	Capacity	m³/h		
1.5	Inclined	yes/no	No	
1.6	Drip Pan	yes/no	Yes	
1.7	Conveyor skit boards	yes/no	Yes	
2.	CONSTRUCTION MATERIAL			
2.1	Drip Pan		304 L S/S	
2.2	Conveyor skit boards		304 L S/S	
2.3	Wedge anchor		304 L S/S	
2.4	Support Structure		304 L S/S	
3.	SAFETY			
3.1	Start delay	yes/no	Yes	
3.2	Warning siren	yes/no	Yes	
4.	WASHING SYSTEM			
4.1	Working Pressure	Bar	4	
4.2	Approx. No. of Spray nozzles	No		
4.3	Water flow rate (approximate)	l/s	5	
4.4	Spray cycles per hour	No		

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Part C1: Agreement and Contract Data

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Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

5.	MOTOR DETAILS			
5.1	Manufacturer			
5.2	IP Rating		55	
5.3	Size (approximate)	kW	0.75	
<u>Deviations from specification:</u> List all the deviations from the specification <i>(If no deviations are listed it confirms that the equipment complies fully with all aspects of the specification.)</i>				

.....
SIGNATURE OF TENDERER

.....
DATE

Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2

TECHNICAL DATA SHEET NO 4

SCREENINGS WASHWATER PUMP EQUIPMENT

AREA: INLET WORKS

No	Item	Unit	Specified	Offered
1.	PUMP DETAILS			
1.1	Manufacturer			
1.2	Model			
1.3	Type (axial, centrifugal, etc)		Centrifugal	
1.4	Number of stages	No	1	
1.5	Rotational speed	rpm		
1.6	DE Bearing		Thrust	
1.7	NDE bearing		Ball or roller	
1.8	Method of lubrication		Oil	
1.9	Solids size handling capability (minimum)	mm	None	
1.10	Outlet diameter	mm		
1.11	Inlet diameter	mm		
1.12	Seal type (mechanical, gland, mechanical flushed, etc)		Mechanical	
1.13	Type of coupling		Direct	
1.14	Load speed-torque characteristics (i.e. Square torque law, constant torque, etc)			
2.	MOTOR DETAILS			
2.1	Manufacturer			
2.2	Motor shaft output at site conditions	kW		
2.3	Rotational speed	rpm		

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Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

2.4	Full load current	A		
2.5	Enclosure rating (IP rating)		IP 55	
2.6	Recommended type of starter (DOL/STAR-DELTA)		DOL	
2.7	Power factor at duty point		>0.86	
2.8	Thermal protection fitted (thermistor/over temp cut-out)		Over temp cut-out	
2.9	Motor heater fitted	(Yes/No)	Yes	
3.	PUMP CHARACTERISTICS			
3.1	Delivery at duty point	l/s	5	
3.2	Head at duty point	m		
3.3	Efficiency at duty point	%	> 50%	
3.4	Power required at duty point	kW		
3.5	Pump best efficiency	%		
3.6	Delivery at best efficiency point	m³/h		
3.7	Head at best efficiency point	m		
4.	CONSTRUCTION MATERIALS			
4.1	Pump casing			
4.2	Impeller			
4.3	Shaft		Stainless steel	
4.4	Mechanical seal faces (if applicable)			
5.	GENERAL DETAILS			
5.1	Total weight of pump (pump and motor)	kg		
5.2	Plinth size required	mm x mm		
Deviations from specification: List all the deviations from the specification <i>(If no deviations are listed it confirms that the equipment offered complies fully with all aspects of the specification).</i>				

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SIGNATURE OF TENDERER

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C1.2
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

TECHNICAL DATA SHEET NO 5
SUBMERSIBLE GRIT PUMPS
AREA: INLET WORKS

No	Item	Unit	Specified	Offered
1.	PUMP DETAILS			
1.1	Manufacturer			
1.2	Model			
1.3	Type (axial, centrifugal, etc)		Centrifugal	
1.4	Type of impeller	No	Vortex	
1.5	Rotational speed	rpm	1500	
1.6	DE Bearing		Thrust	
1.7	NDE bearing		Ball or roller	
1.8	Method of lubrication		Grease	
1.9	Solids size handling capability (minimum)	mm	65	
1.10	Outlet diameter	mm		
1.11	Inlet diameter	mm		
1.12	Seal type (mechanical, gland, mechanical flushed, etc)		Mechanical	
1.13	Type of coupling		Direct	
1.14	Load speed-torque characteristics (i.e. Square torque law, constant torque, etc)			
2.	MOTOR DETAILS			
2.1	Manufacturer			
2.2	Motor shaft output at site conditions	kW		
2.3	Rotational speed	rpm	1500	
2.4	Full load current	A		
2.5	Enclosure rating (IP rating)		IP 68	

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Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

2.6	Recommended type of starter (DOL/STAR-DELTA)		DOL	
2.7	Power factor at duty point		>0.86	
2.8	Thermal protection fitted (thermistor/over temp cut-out)		Over temp cut-out	
2.9	Motor heater fitted	(Yes/No)	Yes	
3.	PUMP CHARACTERISTICS			
3.1	Delivery at duty point	l/s	10	
3.2	Head at duty point	m	5	
3.3	Efficiency at duty point	%		
3.4	Power required at duty point	kW		
3.5	Pump best efficiency	%		
3.6	Delivery at best efficiency point	m³/h		
3.7	Head at best efficiency point	m		
4.	CONSTRUCTION MATERIALS			
4.1	Pump casing			
4.2	Impeller			
4.3	Shaft		Stainless steel	
4.4	Mechanical seal faces (if applicable)			
5.	GENERAL DETAILS			
5.1	Total weight of pump (pump and motor)	kg		
5.2	Plinth size required	mm x mm		
Deviations from specification: List all the deviations from the specification <i>(If no deviations are listed it confirms that the equipment offered complies fully with all aspects of the specification).</i>				

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SIGNATURE OF TENDERER

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DATE

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C1.2
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

TECHNICAL DATA SHEET NO 6 GRIT CLASSIFIER AREA: INLET WORKS				
No	Item	Unit	Specified	Offered
1.	CLASSIFIER DETAILS			
1.1	Manufacturer			
1.2	Model			
1.3	Classifier Type		Screw	
1.4	Trough orientation	deg	25 to horizontal	
1.5	Material of screw, body & outlet		304L SS	
1.6	Protective liner bars		3CR12	
1.7	Min. dry grit discharge capacity	m³/h	1.5	
1.8	Minimum inflow capacity	m³/h	150	
1.9	Outlet chute height	mm	2000	
1.10	Classifier grit inlet pipes	No	2	
1.11	Classifier return water pipe	No	1	
2.	DRIVE UNIT DETAILS			
2.1	Manufacturer of Motor			
2.2	Motor size	kW	0.37	
2.3	Rotational speed	rpm		
2.4	Make of gearbox			
2.5	Reduction ratio			
2.6	Type of control		Both manual & automatic	

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Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

Deviations from specification:

List all the deviations from the specification
(If no deviations are listed it confirms that the equipment offered complies fully with all aspects of the specification).

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SIGNATURE OF TENDERER

.....
DATE

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

TECHNICAL DATA SHEET NO 7

VERTICAL SHAFT MIXERS ANAEROBIC AND ANOXIC ZONES

AREA: BIOLOGICAL REACTOR

No	Item	Unit	Specified	Offered
1.	MIXER DETAILS			
1.1	Manufacturer			
1.2	Model			
1.3	Radial/Axial Flow		Radial flow	
1.4	Type of blades		Curved back swept	
1.5	Number of blades	No		
1.6	Rotational speed	rpm		
1.7	Direction of rotation		reversible	
1.8	Make of gearbox			
1.9	Material of gears		Alloy steel	
1.10	Service factor on motor power		1.75	
1.11	Service factor on max. absorbed power		2	
1.12	Impeller diameter	mm		
1.13	Power absorbed	kW		
1.14	Shaft diameter	mm		
1.15	Method of lubrication		Oil	
2.	MOTOR DETAILS			
2.1	Manufacturer			
2.2	Motor shaft output at site conditions	kW	11	
2.3	Rotational speed	rpm	1460	
2.4	Full load current	A		
2.5	Enclosure rating (IP rating)		IP 55	
2.6	Recommended type of starter (DOL/STAR-DELTA)		DOL	
2.7	Motor heater fitted	(Yes/No)	Yes	

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**C1.2
Contact Data**

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

3.	MIXER CHARACTERISTICS			
3.1	Mixing power input	W/m ³	6	
3.2	Power required at duty point	kW	11	

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SIGNATURE OF TENDERER

.....
DATE

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Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

TECHNICAL DATA SHEET NO 8 SURFACE AERATORS AREA: BIOLOGICAL REACTOR				
No	Item	Unit	Specified	Offered
1.	AERATOR DETAILS			
1.1	Manufacturer			
1.2	Model			
1.3	Type of blades		Back swept	
1.4	Number of blades	No		
1.5	Rotational speed	rpm		
1.6	Direction of rotation		reversible	
1.7	Make of gearbox			
1.8	Material of gears			
1.9	Service factor on max. absorbed power		2.35	
1.10	Impeller diameter	mm		
1.11	Power absorbed	kW	55	
1.12	Shaft diameter	mm		
1.13	Method of lubrication		Oil	
2.	MOTOR DETAILS			
2.1	Manufacturer			
2.2	Motor shaft output at site conditions	kW		
2.3	Rotational speed	rpm		
2.4	Full load current	A		
2.5	Enclosure rating (IP rating)		IP 55	
2.6	Recommended type of starter (DOL/STAR-DELTA)		DOL	
2.7	Motor heater fitted	(Yes/No)	Yes	

THE CONTRACT
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Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

3.	AERATOR CHARACTERISTICS			
3.1	□ factor		0.85	
3.2	□ factor		0.95	
3.3	Site elevation above sea level	m	1012	
3.	Impeller Tip speed	m/s	5	
3.5	Standard Efficiency (Max)	kg O ₂ /kWh	2.0	

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SIGNATURE OF TENDERER

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DATE

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C1.2
Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

TECHNICAL DATA SHEET NO 9

a - RECYCLE PUMP EQUIPMENT

AREA: BIOLOGICAL REACTOR

No	Item	Unit	Specified	Offered
1.	PUMP DETAILS			
1.1	Manufacturer			
1.2	Model			
1.3	Type (axial, centrifugal, etc)		Axial flow	
1.4	Number of stages	No		
1.5	Rotational speed	rpm		
1.6	DE Bearing		Thrust	
1.7	NDE bearing		Ball or roller	
1.8	Method of lubrication		Oil	
1.9	Solids size handling capability (minimum)	mm	100	
1.10	Seal type (mechanical, gland, mechanical flushed, etc)		Mechanical	
1.11	Type of coupling		Gearbox	
1.12	Throat tube size	mm		
2.	MOTOR DETAILS			
2.1	Manufacturer			
2.2	Motor shaft output at site conditions	kW		
2.3	Rotational speed	rpm	980 to 1450	
2.4	Full load current	A		
2.5	Enclosure rating (IP rating)		IP 55	
2.6	Recommended type of starter (DOL/STAR-DELTA)		VSD	
2.7	Power factor at duty point		>0.86	
2.8	Thermal protection fitted (thermistor/over temp cut-out)		Over temp cut-out	
2.9	Motor heater fitted	(Yes/No)	Yes	
3.	PUMP CHARACTERISTICS			
3.1	Delivery at duty point	ℓ/s	139	
3.2	Head at duty point	m	0.4	
3.3	Efficiency at duty point	%		
3.4	Power required at duty point	kW		
3.5	Pump best efficiency	%		
3.6	Delivery at best efficiency point	m³/h		
3.7	Head at best efficiency point	m		
4.	CONSTRUCTION MATERIALS			
4.1	Pump casing			

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Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

TECHNICAL DATA SHEET NO 10
RAS PUMP EQUIPMENT
AREA: BIOLOGICAL REACTOR

No	Item	Unit	Specified	Offered
1.	PUMP DETAILS			
1.1	Manufacturer			
1.2	Model			
1.3	Type (axial, centrifugal, etc)		Axial flow	
1.4	Number of stages	No		
1.5	Rotational speed	rpm		
1.6	DE Bearing		Thrust	
1.7	NDE bearing		Ball or roller	
1.8	Method of lubrication		Oil	
1.9	Solids size handling capability (minimum)	mm	100	
1.10	Seal type (mechanical, gland, mechanical flushed, etc)		Mechanical	
1.11	Type of coupling		Gearbox	
1.12	Throat tube size	mm		
2.	MOTOR DETAILS			
2.1	Manufacturer			
2.2	Motor shaft output at site conditions	kW		
2.3	Rotational speed	rpm	980 to 1450	
2.4	Full load current	A		
2.5	Enclosure rating (IP rating)		IP 55	
2.6	Recommended type of starter (DOL/STAR-DELTA)		VSD	
2.7	Power factor at duty point		>0.86	
2.8	Thermal protection fitted (thermistor/over temp cut-out)		Over temp cut-out	

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Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

2.9	Motor heater fitted	(Yes/No)	Yes	
3.	PUMP CHARACTERISTICS			
3.1	Delivery at duty point	ℓ/s	46	
3.2	Head at duty point	m	1.1	
3.3	Efficiency at duty point	%		
3.4	Power required at duty point	kW		
3.5	Pump best efficiency	%		
3.6	Delivery at best efficiency point	m³/h		
3.7	Head at best efficiency point	m		
4.	CONSTRUCTION MATERIALS			
4.1	Pump casing			
4.2	Impeller			
4.3	Shaft		Stainless steel	
4.4	Mechanical seal faces (if applicable)			
5.	GENERAL DETAILS			
5.1	Total weight of pump (pump and motor)	kg		
5.2	Plinth size required	mm x mm		
Deviations from specification: List all the deviations from the specification <i>(If no deviations are listed it confirms that the equipment offered complies fully with all aspects of the specification).</i>				

.....
SIGNATURE OF TENDERER

.....
DATE

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Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

TECHNICAL DATA SHEET NO 11

BRIDGE SCRAPER SYSTEM

AREA: SECONDARY CLARIFIERS

No	Item	Unit	Specified	Offered
1.0	CONSTRUCTION MATERIAL			
1.1	Bridge Structure			
1.2	Scraper support		304 S/S	
1.3	Scraper carrier.....			
1.4	Scraper blade edges.....		rubber	
1.5	Material of weir & scum baffle.....		304 S/S	
1.6	Peripheral speed of scraper	m/min	3	
1.7	Scraper configuration/formation			
1.8	Dead load deflection.....	mm	0	
1.9	Live load deflection	mm	< 10	
1.10	Mass of bridge & scraper mechanism	kg		
2.0	CENTRAL BEARING SUPPORT			
2.1	Manufacturer			
2.2	Type			
2.3	Bearing load capacity	tons	6	
2.4	L10 Bearing life (minimum)	hrs	100 000	
2.5	Method of lubrication			
3.0	GEARBOX			
3.1	Manufacturer			
3.2	Type			
3.3	Service factor		2	

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Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

3.4	Mechanical power rating (expected)	kW		
3.5	Minimum torque capacity	Nm	1300	
3.6	L10 Bearing life (minimum)	hrs	100 000	
4.0	ELECTRIC MOTOR			
4.1	Manufacturer			
4.2	Rated voltage	V		
4.3	Rated power	kW	0.55	
4.4	Rotational speed	rpm	1450	
4.5	Insulation Class.....		F	
4.6	Power factor.....		>0.86	
5.	SLIP RINGS			
5.1	Type			
5.2	Brush material			
5.3	Rated current			
Deviations from specification:				
List all the deviations from the specification				
(If no deviations are listed it confirms that the equipment offered complies fully with all aspects of the specification).				

.....
SIGNATURE OF TENDERER

.....
DATE

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Contact Data

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

TECHNICAL DATA SHEET NO 12 WAS PUMPING AREA: WAS/RAS PUMP STATION				
No	Item	Unit	Specified	Offered
1.	PUMP DETAILS			
1.1	Manufacturer			
1.2	Model			
1.3	Type (axial, centrifugal, etc)		end-suction centrifugal self-priming	
1.4	Number of stages	No		
1.5	Rotational speed	rpm		
1.6	DE Bearing		Thrust	
1.7	NDE bearing		Ball or roller	
1.8	Method of lubrication		Oil	
1.9	Solids size handling capability (minimum)	mm	50	
1.10	Outlet diameter	mm		
1.11	Inlet diameter	mm		
1.12	Seal type (mechanical, gland, mechanical flushed, etc)		Mechanical	
1.13	Type of coupling			
2.	MOTOR DETAILS			
2.1	Manufacturer			
2.2	Motor shaft output at site conditions	kW		
2.3	Rotational speed	rpm		
2.4	Full load current	A		
2.5	Enclosure rating (IP rating)		IP 55	
2.6	Recommended type of starter (DOL/STAR-DELTA)		VSD	

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TECHNICAL DATA SHEET NO 13

CHLORINATOR

AREA: DISINFECTION SYSTEM

No	Item	Unit	Specified	Offered
1.	CHLORINATOR UNIT DETAILS			
1.1	Manufacturer.....			
1.2	Model.....			
1.3	Maximum dosing capacity.....	kg/h	3.3	
1.4	Minimum dosing capacity.....	kg/h	0.33	
1.5	Dilution water	m ³ /h	16.5	
1.6	Pressure	kPa	600	
1.7	Accuracy (+/- % of indicated flow)	%	4	
1.8	Weight	Kg		
1.9	Operating range	Ratio		
1.10	Control (manual/automatic)			
1.11	Maximum distance from gas supply to chlorinator	m		
1.12	Maximum allowable hardness of injector operating water	mg/l		
1.13	Diameter of control unit connections	Mm		
1.14	Electrical control unit	Volts & amps		
1.15	Mounting arrangement			

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2.	CONSTRUCTION MATERIAL			
2.1				
2.2				
2.3				

Deviations from specification:
List all the deviations from the specification
(If no deviations are listed it confirms that the equipment complies fully with all aspects of the specification.)

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TECHNICAL DATA SHEET NO 14 FLOW METERS AREA: INLET WORKS				
No	Item	Unit	Specified	Offered
1.	ULTRASONIC FLOW METER			
1.1	Manufacturer			
1.2	Model			
1.3	Flow Recording Range	L/sec	0 to 350	
1.4	Method of weather protection offered			
2.	RAS MAGNETIC FLOW METERS			
2.1	Manufacturer			
2.2	Model			
2.3	Flow Recording Range per meter	L/sec	50 to 120	
3.	WAS MAGNETIC FLOW METER			
3.1	Manufacturer			
3.2	Model			
3.3	Flow Recording Range	L/sec	10 to 20	

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TECHNICAL DATA SHEET NO 15

CHLORINATION

AREA: CHLORINATION ROOM

No	Item	Unit	Specified	Offered
1.	CHLORINE DOSING EQUIPMENT			
1.1	Manufacturer of vacuum regulator			
1.2	Model of regulator			
1.3	Manufacturer of dosing regulator			
1.4	Model of dosing regulator			
2.	MOTIVE WATER FEED SYSTEM			
2.1	Manufacturer of motive water pumps			
2.2	Model of pumps			
3.	WEIGHING APPARATUS			
3.1	Manufacturer of weighing apparatus			
3.2	Model			
3.3	Weighing capacity	kg	More than 200kg	

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ELECTRICAL TECHNICAL DATA SHEETS

TECHNICAL DATA SHEET NO 16

DIESEL POWERED GENERATOR SETS (to

be read in conjunction with NRS 024-1)

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1	GENSET REQUIREMENTS			
1.01	Number of units required	No.	1	
1.02	Genset Manufacturer			
1.03	Generator power output (COP)	kVA		
1.04	Generator power output (PRP)	kVA		
1.05	Generator power output (ESP)	kVA		
1.06	Generator power output after site derating (COP)	kVA		
1.07	Generator power output after site derating (PRP)	kVA		
1.08	Generator power output after site derating (ESP)	kVA		
2	DIESEL ENGINE			
2.01	manufacturer			
2.02	model number			
2.03	revolutions at 100 % load r/min	r/min	1500	
	Guarantee that the engine will deliver full load within the required starting period	Yes/No	Yes	
2.06	guaranteed fuel consumption under site conditions			
2.07	full load l/kWh	l/kWh		
2.08	3/4 load l/kWh	l/kWh		
2.09	1/2 load l/kWh	l/kWh		
2.10	guaranteed power output under site conditions	kW		
2.11	drip tray to be provided	Yes/No	Yes	
2.12	Type of service (excluding load test)		Unlimited Prime	
3	COOLING			
3.01	Cooling medium	air/water/othe		
3.02	Method of cooling, if one method preferred		Radiator	
3.03	Intake louvres size	mm X mm		
3.04	Outlet louvres	mm X mm		
3.05	Type		Down Acoustic	
3.06	Material of Construction		Aluminium	
3.07	Sound level at 7m		60dBA	
4	STARTING SYSTEM			
4.01	Any preferred method of starting		Electric Starting	
4.02	Recommended method of starting			

6.01	Engine-driven tachometer (r/min)	Yes/No	Yes, if not on controller	
6.02	Engine temperature gauge °C	Yes/No	Yes, if not on controller	
6.03	Lubricating oil pressure gauge kPa	Yes/No	Yes, if not on controller	
6.04	Oil temperature gauge °C	Yes/No	Yes, if not on controller	
6.05	Starter battery (if applicable) voltage (V)	Yes/No	Yes, if not on controller	
6.06	Running hour meter h	Yes/No	Yes, if not on controller	
6.07	Dirty filter indicator (if applicable)	Yes/No	Yes	
6.08	Other instrumentation recommended			

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TECHNICAL DATA SHEET NO 16

continued

POWERED GENERATOR SETS

(to be read in conjunction with NRS 024-1)

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
7	ENGINE CONTROL			
7.01	Manual start key switch	Yes/No	Yes	
7.02	Speed adjustment	Yes/No	Yes	
7.03	Shutdown in case of fire	Yes/No	links	
8	ALTERNATOR			
8.01	Manufacturer			
8.02	Model number			
8.03	Proposed rated standby output power	kVA		
8.04	Phase-to-phase voltage	V	400 (ph-ph)	
8.05	Motor starting capability @ 30% voltage dip	skVA		
8.06	Range of adjustment of nominal voltage %		± 10	
8.07	Steady state voltage regulation at 0.8 power factor and 4.5% engine speed variations	%	± 3	
8.08	Frequency	Hz	50 ± 2	
8.09	Nominal speed	r/min	1500	
8.10	Maximum rated overspeed %	%	120	
8.11	Excitation method		Brushless	
8.12	Parallel operation required	Yes/No	No	
8.13	Neutral earthing method		Direct	
8.14	Anti-condensation heaters required?	Yes/No	Yes	
	TECHNICAL DATA SHEET NO 16 continued			
	DIESEL POWERED GENERATOR SETS			
9	ALTERNATOR PROTECTION			
9.01	Is sustained short-circuit current rating required?	Yes/No	Yes	
9.02	If Yes, minimum value of current		≥ 3 x I _n sust.10secs	
9.03	Under/overspeed protection required?	Yes/No	Yes	
9.04	Under/over frequency protection required	Yes/No	Yes	
9.05	Over current protection required	Yes/No	Yes	
9.06	Specific earth fault protection requirements		Sensitive E/F	
10	TRANSIENT OUTPUT VARIATIONS			
10.01	Maximum permissible voltage drop	%	30	
10.02	during sudden application of a load step of	kVA	90% of nominal	

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10.03	for a maximum duration of	msec	300	
10.04	Maximum frequency deviation of	%	20	
10.05	during sudden application of a load step	kVA	90% of nominal	
11	ALTERNATOR CONSTRUCTION			
11.01	Single bearing arrangement	Yes/No	Yes	
11.02	Alternator insulation class			
11.03	Stator		H	
11.04	Rotor		H	
11.05	Exciter		H	
11.06	Maximum alternator temperature rise	°C		
	TECHNICAL DATA SHEET NO 16 continued DIESEL POWERED GENERATOR SETS			
12	MECHANICAL BUILD			
12.01	Simplex or duplex frame		Duplex	
12.02	Dimensions			
12.03	Length	mm		
12.04	Width	mm		
12.05	Height	mm		
12.06	Overall mass of set (for lifting purposes)	kg		
12.07	Layout drawing of proposed construction required	Yes/No	Yes	
12.08	Location of exhaust outlet			
12.09	Rain proofing to be provided	Yes/No	Yes	

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TECHNICAL DATA SHEET NO 16
continued
DIESEL POWERED GENERATOR SETS

(to be read in conjunction with NRS 024-1)

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
13	FUEL SYSTEM			
13.01	Bulk fuel tank		Yes	
13.02	Day fuel tank	Yes/No	Yes	
13.03	Capacity of tank			
13.04	Generating time at rated output	hr	8 minimum	
13.05	Volume	l		
13.06	Method to determine tank fuel level		Ultrasonic level sensor	
13.07	Fill of fuel to full level for commissioning	Yes/No	Yes	
13.08	First fill of fuel to full level after commissioning	Yes/No	Yes	
14	FUEL TRANSFER SYSTEM			
14.01	Requirements for fuel transfer			
14.02	Electric pump system	Yes/No	Yes	
14.03	Emergency hand-operated pump system	Yes/No	Yes	
15	EXHAUST SYSTEM			
15.01	Exhaust line material		Stainless steel	
15.02	Lagging required	Yes/No	Yes	
15.03	Type of cladding		Asbestos free	
15.04	Cladding required	Yes/No	Yes	
15.05	Type of cladding		Stainless steel	
	TECHNICAL DATA SHEET NO 16 continued			
	DIESEL POWERED GENERATOR SETS			
16	CONTROL SYSTEM AND PANEL			
16.01	Alarm only or alarm and shut-down operation		Alarm and shutdown	
16.02	Mechanical construction		Mild steel powder coated	
16.03	Type of control system offered		Controller	
16.04	Controller Manufacturer			
16.05	Controller Model number			
16.06	Fieldbus interface to PLC	Yes/No	Yes	
17	BATTERIES AND BATTERY CHARGER			
17.01	Starter battery type			
17.02	Manufacturer			
17.03	Voltage	V	24/48	
17.04	Capacity	Ah	3 consecutive cold starts	

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18	EARTHING		see specifications	
18.01	Earthing system	Type	TNS	
18.02	Neutral earthed in	Alt/CO panel/ source	4 pole, earthed in alternator and source	
19	CORROSION PROTECTION AND FINISH			
19.01	Are tests on painted surfaces required	Yes/No	Yes, visual inspection	
19.02	Final colour of finishes (SANS 1091)		Generator: Supplier standard spec,	
19.03	Engine			
19.04	Alternator			
19.05	Frame			
19.06	Enclosure			

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TECHNICAL DATA SHEET NO 16 continued
DIESEL POWERED GENERATOR SETS
(to be read in conjunction with NRS 024-1)

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
19.07	Control panel colour		Red	
20	FIRE PROTECTION			
20.01	Type of approved fire extinguishers to be fitted		5kg CO2	
20.02	Cable fire-retardant characteristics			
20.03	Fail safe fuel shut-off system type		Mechanical	
20.04	Bund for full capacity plus 10% required around bulk tank	Yes/No	Yes	
20.05	Fireman switch		Yes	
21	TESTS			
21.01	Type tests and certificates required		Yes	
21.02	Factory acceptance test prior to shipping required		Yes	
21.03	Operational works test required		Yes	
21.04	Minimum duration of test hr		As per Project Specs	
21.05	Site tests required		Yes	
22	SUPPLEMENTARY DETAILS			
	TECHNICAL DATA SHEET NO 16 continued			
	DIESEL POWERED GENERATOR SETS			

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TECHNICAL DATA SHEET NO 17
LV SWITCHGEAR AND CONTROLGEAR ASSEMBLIES - MOTOR CONTROL CENTRES

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
	This data sheet is applicable to Motor Control Centres			
1	GENERAL			
1.01	MCC Manufacturer			
1.02	Tested with Stated Deviations to SANS 1973-1	Yes/No	Yes	
1.03	Type Test Certificate Required	Yes / No	Yes	
1.04	Control Voltage	230V/ 24VDC		
1.05	Compartment type	Fixed pattern/ withdrawable		
2	CONSTRUCTION REQUIREMENTS			
2.01	Steel Work Manufacturer			
2.02	Form of Internal Separation		3b/4a	
2.03	Material of Construction	2.00 Mild Steel/ Electro Galvanized/ Stainless Steel/ 3CR12	3CR12	
2.04	Ingress Protection (doors closed)	IP	54	
2.05	Method of Installation		Floor Standing	
	TECHNICAL DATA SHEET NO 17 continued			
2.06	Epoxy Powder Coated	Yes / No	Yes	
2.07	Colour of Assembly		Electric Orange	
2.08	Size of Panel	HxWxD	H <2100	
2.09	Spare Space Required	%	>=20	
2.10	Access	Back / Front / Side	Front & Rear	
2.11	Cable Entry	Top /	Bottom	
2.12	Doors / Removable Panels		Doors	
2.13	Door Locks	Yes / No	Yes	
2.14	Door Locks - Type		Square key	
2.15	Door Locks - Material		Stainless Steel 316	
2.16	Hinges	Yes / No	Yes	
2.17	Hinges - Type		Perano	
2.18	Hinges - Material		Stainless Steel 316	
2.19	Stays at 95° Opening	Yes / No	Yes	
2.20	Incomer Section Required	Yes / No	Yes	
2.21	Essential Section Required	Yes / No	No	
2.22	UPS Section Required	Yes / No	No	

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2.23	Corrosion protection		Epoxy coated HDG	
2.24	Gland Plates		Not painted; Alu for single core cables	
2.25	Estimated Weight	Kg		
	ELECTRICAL COMPONENTS	-		
3	Busbars			
	TECHNICAL DATA SHEET NO 17 continued			
3.01	Material		Copper	
3.02	Tinned	Yes / No	Yes	
3.03	Current Density	A/mm ²	<2 as per type test	
4	Air Circuit Breakers			
4.01	Manufacturer			
4.02	Type		Withdrawable	

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DATA SHEET No. TD-EL-002**LV SWITCHGEAR AND CONTROLGEAR ASSEMBLIES - MOTOR CONTROL CENTRES**

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
4.03	Model			
4.04	Rated Current	A	As per SLD	
4.05	Service short-circuit breaking capacity (Ics)	kA	As per SLD	
4.06	Overload release		Electronic	
4.07	Short-circuit release		Electronic	
4.08	Motorised	Yes / No		
5	Moulded Case Circuit Breakers			
5.01	Manufacturer			
5.02	Type		Fixed	
5.03	Model			
5.04	Rated Current	A	As per SLD	
5.05	Service short-circuit breaking capacity (Ics)	kA	As per SLD	
5.06	Overload release		Thermal/ electronic	
5.07	Short-circuit release		Magnetic/ electronic	
6	Miniature Circuit Breakers			
6.01	Manufacturer			
6.02	Type			
6.03	Model			
6.04	Rated current	A		
6.05	Service Short-circuit breaking capacity (Ics)	KA		
6.06	Tripping Curve		C or as per SLD	
7	Surge Arrestors			
7.01	Power Circuits - Manufacturer			
7.02	Power Circuits - Model			
7.03	Power Circuits - Rating	kA		
7.04	Remote Indication to PLC	Yes / No		
7.05	Control Circuits - Manufacturer			
7.06	Control Circuits - Model			
7.07	Remote Indication to PLC	Yes / No	Yes	
8	Contactors			
8.01	Manufacturer			
8.02	Model			
8.03	Contactor rating		AC3	
8.04	Coordination		Type 2	
9	Overload Relays			
9.01	Manufacturer			
9.02	Type			
9.03	Model			
9.04	Rated Current	A		
9.05	Resetable from front of MCC	Yes / No	Yes	
9.06	HMI	Yes / No	No	
10	Miniature Relays			
10.01	Manufacturer			
10.02	Model			
11	Control switches and pushbuttons			
11.01	Manufacturer			
11.02	Model			
12	Indicating Lamps			
12.01	Manufacturer			
12.02	Model			
12.03	Type		LED	

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LV SWITCHGEAR AND CONTROLGEAR ASSEMBLIES - MOTOR CONTROL CENTRES

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DATA SHEET No. TD-EL-003**LV SWITCHGEAR AND CONTROLGEAR ASSEMBLIES - LOCAL CONTROL PANELS**

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
	This data sheet is applicable to Local Control Panels:			
1	GENERAL			
1.01	LCP Manufacturer			
1.02	Control Voltage	230V/ 24VDC		
2	CONSTRUCTION REQUIREMENTS			
2.01	Steel Work Manufacturer			
2.02	Form of Internal Separation		1	
2.03	Material of Construction		3CR12	
2.04	Ingress Protection (doors closed)	IP	54	
2.05	Method of Installation		Wall mounted	
2.06	Epoxy Powder Coated	Yes / No	Yes	
2.07	Colour of Assembly			
2.08	Size of Panel	HxWxD	H <1600	
2.09	Spare Space Required	%	>=35	
2.10	Access	Back / Front / Side	Front	
2.11	Cable Entry	Top / Bottom	Bottom	
2.12	Doors / Removable Panels		Doors	
2.13	Door Locks	Yes / No		
2.14	Door Locks - Type			
2.15	Door Locks - Material		Stainless Steel 316	
2.16	Incomer Section Required	Yes / No	Yes	
2.17	Corrosion protection		S6 solder tinned	
2.18	Gland Plates		Not painted	
	ELECTRICAL COMPONENTS	-		
3	Moulded Case Circuit Breakers			
3.01	Manufacturer			
3.02	Type		Fixed	
3.03	Model			
3.04	Rated Current	A	As per SLD	
3.05	Service short-circuit breaking capacity (Ics)	kA	As per SLD	
3.06	Overload release		Thermal/ electronic	
3.07	Short-circuit release		Magnetic/ electronic	
4	Miniature Circuit Breakers			
4.01	Manufacturer			
4.02	Type			
4.03	Model			
4.04	Rated Current	A		
4.05	Service short-circuit breaking capacity (Ics)	kA		
4.06	Tripping Curve		C or as per SLD	
5	Surge Arrestors			
5.01	Power Circuits - Manufacturer			
5.02	Power Circuits - Model			
5.03	Power Circuits - Rating	kA		
5.04	Remote Indication to PLC	Yes / No	Yes	
5.05	Control Circuits - Manufacturer			
5.06	Control Circuits - Model			
6	Contactors			
6.01	Manufacturer			

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TECHNICAL DATA SHEET NO 19**continued****LV SWITCHGEAR AND CONTROLGEAR ASSEMBLIES - LOCAL CONTROL PANELS**

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
6.02	Model			
6.03	Contactor rating		AC3	
6.04	Coordination		Type 2	
7	Overload Relays			
7.01	Manufacturer			
7.02	Type			
7.03	Model			
7.04	Rated Current	A		
7.05	Resetable from front of Panel	Yes / No	Yes	
8	Miniature Relays			
8.01	Manufacturer			
8.02	Model			
9	Control switches and pushbuttons			
9.01	Manufacturer			
9.02	Model			
10	Indicating Lamps			
	TECHNICAL DATA SHEET NO 19			
	continued			
10.01	Manufacturer			
10.02	Model			
10.03	Type		LED	
11	Control-Circuit and auxiliary supply transformer			
11.01	Manufacturer			
12	FIELD E-STOP/START LOCAL CONTROL STATIONS			
12.01	Method of Installation		Pedestal	
12.02	Material of Construction		3CR12	
12.03	Manufacturer			
12.04	Keyswitch Required	Yes / No	No	
12.05	IP rating	IP	65	
13	SUPPLEMENTARY DETAILS			

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TECHNICAL DATA SHEET NO 20 LV ELECTRICAL MOTORS - MOTORS < 50kW				
	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1	ELECTRICAL OPERATING CONDITIONS			
1.01	Supply voltage (nominal)	V	400	
1.02	Number of phases		3	
1.03	Frequency	Hz	50	
1.04	Voltage and frequency variations	%	As per SANS 1804-2	
1.05	Supply voltage harmonic voltage factor		As per SANS 60034-1	
1.06	Supply voltage negative sequence component	%	2	
1.07	Supply neutral earthed directly/resistively (high/low)		Directly	
2	GENERAL			
2.01	Manufacturer			
2.02	Model			
3	MOTOR RATING			
3.01	Rated output	kW	as per Contractor's design	
3.02	Duty type		S1	
3.03	Output margin above load absorbed power	%	15	
3.04	Speed (synchronous)	rpm	1500	
3.05	Speed at rated output, voltage and frequency	rpm		
	TECHNICAL DATA SHEET NO 20 continued			
3.06	Rated voltage	V	400	
3.07	Full load current	A		
3.08	Efficiency class (IE1/2/3)		IE2	
3.09	Rated torque	Nm		
4	ENCLOSURE, CONSTRUCTION & MOUNTING			
4.01	Ingress protection rating		IP55, IP68 for submersible	
4.02	Cooling method		IC411	
4.03	Construction and mounting arrangement		IM B3	
4.04	Terminal box location (R/B/L/T)		as per Contractor's design	
4.05	Cable entry location		Below	
4.06	Cable type and size		As per SLD	
4.07	Corrosion protection (standard/corrosive environment)		Corrosive	
5	WINDINGS TYPE, INSULATION & TEMPERATURE RISE			

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5.01	Stator winding type (random/formed diamond coil)		<i>Formed</i>	
5.02	Insulation and impregnation system		<i>VPI</i>	
5.03	Insulation thermal class	(F/H)	<i>F</i>	
5.04	Temperature rise class	(B/F)	<i>B</i>	
5.05	Maximum temperature rise at rated output (Zone A supply)	<i>K</i>		
5.06	Maximum temperature rise at rated output (Zone C supply)	<i>K</i>		
5.07	Windings thermal protection (thermistor/PT100) per winding			
6	GENERAL PERFORMANCE			
6.01	Efficiency at rated output	%		
6.02	Efficiency at rated 75% output	%		
6.03	Efficiency at rated 50% output	%		
6.04	Power factor at rated output	pu		
6.05	Power factor at 75% rated output	pu		
6.06	Power factor at 50% rated output	pu		
6.07	Sound power level at rated load	dBA		
6.08	Silencer required	Yes / No	No	
7	STARTING PERFORMANCE			
7.01	Starting method		As per SLDs	

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TECHNICAL DATA SHEET NO 20 continued
LV ELECTRICAL MOTORS - MOTORS < 50kW

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
7.02	Motor moment of inertia	kg.m ²		
7.03	Number of starts per hour (cold/hot)		6/2	
7.04	Starting current (x full load current)	A		
7.05	Starting torque (x rated torque)	N m		
7.06	Pull-up torque (x rated torque)	N m		
7.07	Breakdown torque (x rated torque)	N m		
7.08	Starting power factor	pu		
7.09	Run up time of driven load (state pu starting current)	s		
8	DRIVEN LOAD AND COUPLING			
8.01	Load type		Various	
8.02	Load moment of inertia at motor speed	kg.m ²		
8.03	Coupling method (direct/gearbox/v-belt)			
9	BEARINGS			
9.01	Manufacturer			
9.02	DE bearing type (ball/roller/sleeve)		Ball/roller	
9.03	DE bearing lubrication type (sealed/regreasable)			
9.04	DE bearing life (L10)	h		
9.05	DE bearing regrease interval	h		
9.06	NDE bearing type (ball/roller/sleeve)		Ball/roller	
9.07	NDE bearing lubrication type (sealed/regreasable)			
9.08	NDE bearing life (L10)	h		
	TECHNICAL DATA SHEET NO 20 continued			
9.09	NDE bearing regrease interval	h		
9.10	Bearing thermal protection (thermistor/PT100)			
10	DIMENSIONS AND WEIGHT			
10.01	Motor frame number			
10.02	Motor weight	kg		
11	VARIABLE SPEED APPLICATIONS			
11.01	Operating speed range	rpm	As per load	
11.02	Maximum safe operating speed	rpm		
11.03	Peak voltage withstand level	V		
11.04	Voltage gradient withstand level	V/s		
11.05	Separately-powered cooling fan			
12	OPTIONAL ITEMS			
12.01	Anti-condensation heaters	Yes / No	Yes	
12.02	Slide rails (for v-belt drives)	Yes / No	No	

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12.03	Surge protection devices	Yes / No	No	
12.04	Adjusting bolts required	Yes / No	Yes	
13	FACTORY TESTS			
13.01	Routine tests in addition to SANS 1804-2 requirements			
13.02	Insulation resistance check	Yes / No	Yes	
	TECHNICAL DATA SHEET NO 20 continued			
13.03	Vibration velocity measurement	Yes / No	No	
13.04	Type tests in addition to SANS 1804-2 requirements			
13.05	Current vs speed curve	Yes / No	Yes	
13.06	Torque vs speed curve	Yes / No	Yes	

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TECHNICAL DATA SHEET NO 21
ELECTRICAL ACTUATORS

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1	GENERAL			
1.01	Make			
1.02	Model			
1.03	Type			
1.04	Design Life (according to SANS 60034-1)	Class		
1.05	Weight - Actuator	kg		
	CONTROL	-		
2	Remote Signals Required			
2.01	Valve Fully Open	Yes / No	Yes	
2.02	Valve Fully Closed	Yes / No	Yes	
2.03	Valve in an Intermediate Position	Yes / No		
2.04	Locked Out (by Switch-Disconnecter)	Yes / No		
2.05	Local/Off/Remote	Yes / No	Yes	
2.06	Fault	Yes / No	Yes	
3	Other Signals			
3.01	Valve Position Monitor (4-20mA) Required	Yes / No	As per P&ID	
3.02	Actuator Torque Monitor (4-20mA) Required	Yes / No		
	TECHNICAL DATA SHEET NO 21 continued			
3.03	Fieldbus Compatibility	Yes / No	Yes	
4	ENCLOSURE			
4.01	Ingress Protection	IP	68	
4.02	Paint Colour			
4.03	Motor Class of Insulation			
5	SUPPLEMENTARY DETAILS			

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TECHNICAL DATA SHEET NO 22
CABLES AND CABLE SUPPORTS

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1	LOW VOLTAGE CABLES			
1.01	Manufacturer			
1.02	Operating Voltage	V	600/1000	
1.03	Number of Cores	No	See Specifications and SLDs	
1.04	Size	mm ²		
1.05	Conductor Type	Cu/Al		
1.06	Cable Type			
1.07	Full Load Current	A		
1.08	Armouring	Yes/No	Yes, SWA or AWA for single core	
1.09	Depth of installation	mm (to cable centre)	650	
1.10	Outdoor Cable Markers	Yes/No	No	
2	CABLE LADDER			
2.01	Manufacturer			
2.02	Type			
2.03	Material		HDG	
2.04	Duty	Heavy / Medium	Heavy	
2.05	Application			
	TECHNICAL DATA SHEET NO 22 continued			
3	WIRE MESH TRAY			
3.01	Manufacturer			
3.02	Type			
3.03	Material		HDG	
3.04	Duty	Heavy / Medium	Heavy	
3.05	Application			
4	CONDUITS			
4.01	Manufacturer			
4.02	Type			
4.03	Material		316 Stainless Steel (304 inside MCC)	
4.04	Duty	Heavy / Medium	Medium	
4.05	Application		C&I cabling	

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5	SUPPLEMENTARY DETAILS			

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DATA SHEET No. TD-EL-007
DISTRIBUTION BOARDS AND KIOSKS

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1	ELECTRICAL CHARACTERISTICS			
1.01	Supply Voltage	V	400	
1.02	Frequency	Hz	50	
1.03	DB Main Busbar Rating	A	As per SLDs	
1.04	Fault Level Rating	kA	As per SLDs	
1.05	Number of Phases	Num	3	
1.06	Cascading Allowed	Yes / No	No	
1.07	Control Voltage	V	230	
1.08	Supplied From		Various	
1.09	Upstream Supply size	kVA	Various	
1.10	Estimated Load (After Diversification)	kVA	Various	
1.11	Earthing	Earth Stud	Earth Bar	
1.12	Neutral	Full / Half	Full Neutral	
2	STREETLIGHTING KIOSKS			
2.01	Manufacturer		Polybox or similar and approved	
2.02	Type			
2.03	Details		See Single Line drawings	
2.04	Surge Arrestors	Yes/No	Yes	
2.05	SANS compliant	Yes/No	Yes	
3	DISTRIBUTION BOARDS			
3.01	Manufacturer			
3.02	Type			
3.03	Details		See Single Line drawings	
3.04	SABS approved	Yes/No	Yes	
4	COMPONENTS			
4.01	Busbars			
5	Material		Copper	
5.01	Tinned	Yes / No	Yes	
5.02	Current Density	A/mm ²	2	
6	Moulded Case Circuit Breakers			
6.01	Manufacturer			
6.02	Type		Fixed	
6.03	Model			
6.04	Rated Current	A	As per SLD	
6.05	Service short-circuit breaking capacity (Ics)	kA		
6.06	Overload release		Thermal/ electronic	
6.07	Short-circuit release		Magnetic/ electronic	
7	Miniature Circuit Breakers			
7.01	Manufacturer			
7.02	Type			
7.03	Model			
7.04	Rated Current	A		
7.05	Service short-circuit breaking capacity (Ics)	kA		
7.06	Tripping Curve		C or as per SLD	
8	Fuse-Switch-Disconnecter			
8.01	Manufacturer			
8.02	Model			

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TECHNICAL DATA SHEET NO 24
SMALL POWER AND LIGHTING

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
	POWER OUTLETS	-		
1	Normal Switched Socket Outlets			
1.01	Manufacturer			
1.02	Type			
1.03	Ingress Protection	IP	43/65	
1.04	Faceplate Colour		White	
1.05	Mounting	Flush/recessed in power skirting	Various	
1.06	SABS approved	Yes / No	Yes	
2	Industrial Switched Socket Outlets			
2.01	Manufacturer			
2.02	Type			
2.03	Ingress Protection	IP	55	
2.04	Faceplate Colour		White	
2.05	Mounting	Flush/recessed in power skirting	Various	
2.06	SABS approved	Yes / No	Yes	
	TECHNICAL DATA SHEET NO 24 continued			
3	3 Phase Industrial Switched Socket Outlets			
3.01	Manufacturer			
3.02	Type			
3.03	Ingress Protection	IP	55	
3.04	Mounting	Flush/recessed in power skirting	Flush	
3.05	SABS approved	Yes / No	Yes	
4	Normal Dedicated Switched Socket Outlets			
4.01	Manufacturer			
4.02	Type			
4.03	Ingress Protection	IP		
4.04	Faceplate Colour		Red	
4.05	Mounting	Flush/recessed in power skirting	Various	
4.06	SABS approved	Yes / No	Yes	

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	ISOLATORS	-		
5	Double Pole			
5.01	Manufacturer			
5.02	Type			
5.03	Ingress Protection	IP	65	
	TECHNICAL DATA SHEET NO 24 continued			
5.04	Mounting		Flush	
5.05	SABS approved	Yes / No	Yes	
6	3 Pole			
6.01	Manufacturer			
6.02	Type			
6.03	Ingress Protection	IP	65	
6.04	Mounting		Flush	

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TECHNICAL DATA SHEET NO 24 continued
SMALL POWER AND LIGHTING

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
6.05	SABS approved	Yes / No	Yes	
7	TELEPHONE AND DATA OUTLETS			
7.01	Manufacturer			
7.02	Type		RJ45/RJ11 combo	
7.03	Colour		White	
7.04	Mounting	Flush/reces sed in power skirting	Various	
7.05	SABS approved	Yes / No	Yes	
8	LIGHTING			
8.01	Photocell (Day/Night Switch) (for kiosk)			
9	Manufacturer			
9.01	Model			
9.02	SABS approved	Yes / No	Yes	
10	Photocell (Day/Night Switch) Mounted outside building			
10.01	Manufacturer			
10.02	Model			
10.03	SABS approved	Yes / No	Yes	
11	Lighting Ballast			
11.01	Manufacturer			
11.02	Type			
11.03	Details			
11.04	SABS approved	Yes/No	Yes	
12	Light Switches			
12.01	Colour		White	
12.02	Flush mounted	Yes/No	Yes	
12.03	Manufacturer			
12.04	Type			
13	GRP Poles			
13.01	Manufacturer /Supplier		BEKA or similar and approved	
13.02	Height		Various, Refer to drawings	

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TECHNICAL DATA SHEET NO 24 continued
SMALL POWER AND LIGHTING

14	SINGLE CORE PVC INSULATED CABLE			
14.01	Manufacturer			
14.02	Type			
15	HOUSE WIRE			
15.01	Manufacturer			
	TECHNICAL DATA SHEET NO 24 continued			
15.02	Type			
16	WIREMESH CABLE TRAY			
16.01	Manufacturer / Type			
16.02	Details			
17	CABLE TRAY			
17.01	Manufacturer / Type			
17.02	Details			
18	CABLE LADDER			
18.01	Manufacturer / Type			
18.02	Details			
19	TRUNKING			
19.01	Manufacturer / Type			
19.02	Details			
20	POWERSKIRTING			
20.01	Manufacturer / Type			
20.02	Colour			
	TECHNICAL DATA SHEET NO 24 continued			
21	CONDUITS			
21.01	Manufacturer / Type			

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SMALL POWER AND LIGHTING

22	SUPPLEMENTARY DETAILS			

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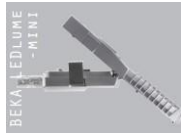
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TECHNICAL DATA SHEET NO 25
LIGHTING SCHEDULE

Luminaire / Device Type:	Description	Supplier / Manufacturer:	Product Name / Code:	Mounting Height/ Location:	Image:	Usage Areas:	Lamp Type:	Luminaire Size (mm)	Plug/Lead type:
L1	Vapour proof fitting	Voltex	C10-48W-LED	Wall mounted/ Ceiling Mounted		Indoor - Industrial Areas	48W, 230 volt LED	1270x160x98	N/A - Hard wired
L2	Outdoor Bulkhead	BEKA schreder	BEKABULK LED	Wall Mounted		Outdoor - Exit doors - Building perimeter	18W, 230 volt LED	325x155x122	N/A - Hard wired
SL1	Streetlight	BEKA schreder	BEKA LEDlume Mini	Pole Mounted		Outdoor	36W, 230 volt LED		N/A - Hard wired

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DATA SHEET No. TD-CI-001**CONTROL, INSTRUMENTATION, DATA CABLES AND JUNCTION BOXES**

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1	CONTROL CABLES			
1.01	Manufacturer			
1.02	Size	mm ²	1.5	
1.03	Operating Voltage	V	24VDC/230VAC	
1.04	Number of Cores	No	See Specifications	
1.05	Size	mm ²		
1.06	Conductor Type	Cu/Al		
1.07	Cable Type			
1.08	Full Load Current	A		
1.09	Armouring	Yes/No	Yes, SWA	
2	INSTRUMENTATION CABLES			
2.01	Manufacturer			
2.02	Operating Voltage	V	24VDC/230VAC	
2.03	Size	mm ²	1.5	
2.04	Cable Type		Twisted Pair	
2.05	Screened		Individually and Overall	
2.06	Armouring	Yes/No	Yes	
3	MULTIMODE FIBRE OPTIC			
3.01	Manufacturer			
3.02	Type		Multimode	
3.03	Armouring	Yes/No	Yes, for outdoor and exposed cables.	
3.04	Armouring Type		Steel Tape Armoured	
3.05	Termination preference type		ST	
3.06	Cores	No	min 12	
3.07	Cable Category		min OM 2	
3.08	Modal Bandwidth	MHz.km	min 500 / 500	
4	DATA CABLES: ETHERNET			
4.01	Manufacturer			
4.02	Type		CAT6 STP	
4.03	Armouring	Yes/No	APL for outdoor cables	
4.04	Termination Type		RJ 45 (Moulded case type)	
5	DATA CABLES: PROFIBUS			
5.01	Manufacturer			
5.02	Type		CAT6 STP	
5.03	Armouring	Yes/No	No, APL for outdoor cables	
5.04	Termination Type		RJ 45 (Moulded case type)	
6	INSTRUMENTATION JUNCTION BOXES			
6.01	Enclosure Material		Stainless Steel 316	
6.02	Enclosure Colour		Siemens Grey	
6.03	Enclosure Rating	IP	65	
6.04	Enclosure Mounting	Floor Standing / wall mounted	Pedestal or wall mounted	
6.05	Typical drawing included with specification	Yes	Yes	

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TECHNICAL DATA SHEET NO 26 continued

CONTROL, INSTRUMENTATION, DATA CABLES AND JUNCTION BOXES

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TECHNICAL DATA SHEET NO 27
PROGRAMMABLE LOGIC CONTROLLERS

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1	PROGRAMMABLE LOGIC CONTROLLERS			
1.01	Manufacturer		Modicon M580 with X80 EIO or Approved Equivalent	
1.02	Model			
1.03	CPU			
1.04	CPU configuration			
1.05	Digital Inputs	No.		
1.06	Digital Outputs	No.		
1.07	Analogue Inputs	No.		
1.08	Analogue Outputs	No.		
1.09	Spare I/O	%	30%	
1.10	Ports			
1.11	Ethernet	No.		
1.12	Serial	No.		
1.13	Other	No.		
1.14	Software			
1.15	All engineering software included with PLC	Yes / No	Yes	
1.16	Annual Software License renewal required	Yes / No		
1.17	Programming Language		IEC 61131	
2	REMOTE IO			
2.01	Manufacturer		Modicon X80 EIO or approved	
2.02	Model			
2.03	Ethernet Ports	No.	min 4	
2.04	Digital Inputs	No.		
2.05	Digital Outputs	No.		
2.06	Analogue Inputs	No.		
2.07	Analogue Outputs	No.		
2.08	Spare I/O	%	30%	
2.09	Power Supply	VAC	230V	
2.10	Datasheet included with tender	Yes / No	Yes	
3	PLC PANEL			
3.01	Enclosure Material		as per MCC	
3.02	Enclosure Colour		as per MCC	
3.03	Enclosure Rating	IP	42	
3.04	Enclosure Mounting	Floor Standing / wall mounted	Floor Standing	

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	TECHNICAL DATA SHEET NO 27 continued			
3.05	Supply and Control Circuit Voltages	V	24V DC	
3.06	Wire Colours		as per spec	
3.07	Glass door - viewing panel	Yes / No	Yes	
3.08	Termination			
3.09	Glanding			
3.10	Power Supply Unit vendor preferences			
3.11	Uninterruptible Power Supply requirement	Yes / No	Yes	
3.12	Panel light required	Yes / No	Yes, LED	
3.13	Socket outlet required	Yes / No	Yes	
3.14	Physical Spare space	%	30	
4	HUMAN MACHINE INTERFACE (HMI)			
4.01	Manufacturer		Magelis or approved equivalent	
4.02	Model		Magelis GTU or approved equivalent	
4.03	Screen Size	Inches	15"	
4.04	Screen Type		Display LCD, Colour TFT	
4.05	Resolution	Pixels	1,024 x 768 pixels, 16 M colors	
4.06	Touch Screen	Yes / No	Yes	
4.07	Type of Touch Screen	Capacitive/ Resistive		
4.08	Enclosure Rating	IP	65	
4.09	Position of Installation	Inside Panel / Flush Fronted /	Flush Fronted	
4.10	Software	Front		
4.11	Datasheets included with tender	Yes / No	Yes	
5	UPS			
5.01	Manufacturer			
5.02	Model			
5.03	Place of manufacture			
5.04	Type		Industrial inline double conversion with full static bypass	
5.05	Power	W	Load + 30%	
5.06	Backup Time	min	30	
5.07	Output Voltage	V	230V +-5%	
5.08	Nominal Frequency	Hz	50	
5.09	Output Waveform		Pure sine wave	
5.10	Number of Phases	1 or 3	1	
5.11	Communication		Ethernet	
5.12	Battery Life	Years	Min 10.	

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	TECHNICAL DATA SHEET NO 27 continued			
5.13	Battery Type		Li-Ion	
5.14	Battery Charger			
5.15	Datasheets included with tender	Yes / No	Yes	
6	MANAGED ETHERNET SWITCH			
6.01	Manufacturer			
6.02	Model			
6.03	Ethernet Ports	No.	min 4	
6.04	Fibre ports (SFP)	No.	min 4	
6.05	Fibre Termination type		ST	
6.06	Mounting type		Din rail	
6.07	Power Supply	VAC	230V	
6.08	Speed	Mbit	1000	
6.09	Datasheet included with tender	Yes / No	Yes	
7	UNMANAGED SWITCHES			
7.01	Manufacturer			
7.02	Type			
7.03	Model			
8	PROFIBUS MASTER SWITCH			
8.01	Manufacturer			
8.02	Type			
8.03	Model			
9	SOLENOID VALVE TERMINAL			
9.01	Manufacturer		Festo or similar	
9.02	Type			
9.03	Model			
9.04	Communication Protocol		Profibus	
10	FIBRE PATCH PANEL			
10.01	Manufacturer			

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TECHNICAL DATA SHEET NO 27 continued **PROGRAMMABLE LOGIC CONTROLLERS**

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TECHNICAL DATA SHEET NO 28
SCADA

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
1	DESKTOP COMPUTER			
1.01	Manufacturer			
1.02	Model			
1.03	CPU		Intel i7 or higher	
1.04	Type			
1.05	Speed	GHz	>3	
1.06	Memory	MB	>=16000	
1.07	Hard Drive Storage	GB		
1.08	Operating System		MS Windows	
1.09	Optical Storage		DVD-RW	
1.10	Network Card		Ethernet 10/100/1000	
1.11	Graphics Card		>256MB, output to drive 2 x 23" display - ability to drive 2	
1.12	Graphics Card Ports		HDMI	
1.13	Keyboard		Yes	
1.14	Mouse		Yes	
2	HOT-STANDBY SERVER			
2.01	Manufacturer			
2.02	CPU			
2.03	Type			
2.04	Cores	No.	>6	
2.05	Speed	GHz	>3GHz	
2.06	Memory	MB	>=32000	
2.07	Hard drives		Raid hot swappable	
2.08	Hard Drive Storage	GB	>1TB	
2.09	Hard Drive Speed	RPM	>=10000	
2.10	Data transfer rate	GB/s	>=12 SAS	
2.11	Motherboard		Industrial motherboard, conformal coating	
2.12	Power supplies		Raid hot swappable	
2.13	Operating System		latest Windows server	
2.14	Optical Storage		DVD-RW	
2.15	Network Card		Ethernet 10/100/1000	
2.16	Graphics Card		>256MB, Dual output to drive 1 x 23"	
2.17	Keyboard		Yes - shared KVM	
	TECHNICAL DATA SHEET NO 28 continued			

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2.18	Mouse		Yes - shared KVM	
2.19	Mounting Type		Rack mountable	
3	HISTORIAN/DATABASE SERVER			
3.01	Manufacturer			
3.02	CPU			
3.03	Type			
3.04	Cores	No.	>6	
3.05	Speed	GHz	>3GHz	
3.06	Memory	MB	>=32000	
3.07	Hard drives		Raid hot swappable	
3.08	Hard Drive Storage	GB	>1TB	
3.09	Hard Drive Speed	RPM		
3.10	Data transfer rate	GB/s		
3.11	Motherboard		Industrial motherboard, conformal coating	
3.12	Power supplies		Raid hot swappable	
3.13	Operating System		latest Windows server	
3.14	Optical Storage		DVD-RW	
3.15	Network Card		Ethernet 10/100/1000	
3.16	Graphics Card		>256MB, Dual output to drive 1 x 23"	
3.17	Keyboard		Yes - shared KVM	
3.18	Mouse		Yes - shared KVM	
3.19	Mounting Type		Rack mountable	
4	TIME SYNCHRONISATION			
4.01	GPS Clock synchronisation	Yes / No	Yes	
4.02	NTP Clock synchronisation	Yes / No	Yes	
5	DISPLAY SCREENS(23")			
5.01	Manufacturer			
5.02	Model			
5.03	Type		HD LED (23") ,	
5.04	Size		2 x 23",1 x50"	
5.05	Resolution		>=1080p	
5.06	Graphics ports		HDMI & VGA enabled	
6	SOFTWARE			
	TECHNICAL DATA SHEET NO 28 continued			
6.01	SCADA software			
6.02	Number of Tags	No.		

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6.03	Clients	No.	4	
6.04	Anti-Virus Software	Yes / No	Yes	
6.05	Mobile/Anywhere Clients	Yes / No	Yes	
6.06	Mobile/Anywhere Clients	No.	5	
7	HISTORIAN			
7.01	Historian Software			
7.02	Version			
7.03	Number of Tags	No.		
7.04	Anti-Virus Software	Yes / No	Yes	
8	PRINTER			
8.01	Manufacturer			
8.02	Model			
8.03	Type		Colour Laser	
8.04	Feeding Paper Size		A4	
9	UPS			
9.01	Manufacturer			
9.02	Model			
9.03	Place of manufacture			
9.04	Type		Industrial inline double conversion with full static bypass	
9.05	Power	W	Load + 30%	

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TECHNICAL DATA SHEET NO 28 continued
SCADA

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
9.06	Backup Time	min	30	
9.07	Output Voltage	V	230V +-5%	
9.08	Nominal Frequency	Hz	50	
9.09	Output Waveform		Pure sine wave	
9.10	Number of Phases	1 or 3	1	
9.11	Communication		Serial/Ethernet	
9.12	Battery Life	Years	Min 10.	
9.13	Battery Type		Li-Ion	
9.14	Battery Charger			
9.15	Rack mounted	Yes / No	Yes	
9.16	Datasheets included with tender	Yes / No	Yes	
10	COPPER DATA CABLES			
10.01	Type		CAT6 STP	
10.02	Manufacture			
11	SUPERVISORY LAYER ETHERNET SWITCH			
11.01	Manufacturer			
11.02	Type		Managed	
11.03	Model			
11.04	Ports	No.		
11.05	Fibre ports (SFP/GBICs)	No.		
11.06	Rack mounted	Yes/No	Yes	
11.07	Power Supply	VAC	230V	
11.08	Speed	Mbit	1000	
11.09	PoE		PoE enabled	
11.10	Datasheet included with tender	Yes / No	Yes	
12	CONTROL LAYER ETHERNET SWITCH			
12.01	Manufacturer			
12.02	Type		Managed	
12.03	Model			
12.04	Ports	No.		
12.05	Fibre ports (SFP/GBICs)	No.	4	
12.06	Rack mounted	Yes/No	Yes	
12.07	Power Supply	VAC	230V	
12.08	Speed	Mbit	1000	
12.09	PoE		PoE enabled	
12.10	Datasheet included with tender	Yes / No	Yes	
13	WORK STATION FURNITURE			
	TECHNICAL DATA SHEET NO 28 continued			
13.01	Manufacturer			

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13.02	Model			
13.03	Sketch/Drawing included with tender	Yes / No	Yes	
14	SERVER RACK CABINET			
14.01	Manufacturer			
14.02	Model			
14.03	Size	U		
14.04	Dimensions	(W x L) in mm		
14.05	Locakable	Yes/No	Yes	
14.06	Mounting type		Floor standing	
14.07	Power Distribution	Dedicated Multiplug / Hardwired	Dedicated Multiplug	
14.08	Sketch/Drawing layout included with tender	Yes / No	Yes	
0.01	SUPPLEMENTARY DETAILS			

.....
SIGNATURE OF TENDERER

.....
DATE

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TECHNICAL DATA SHEET NO 29
INSTRUMENTATION

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
0.01	ULTRASONIC LEVEL METER			
1	Manufacturer			
1.01	Sensor Model			
1.02	Transmitter Model			
1.03	Number of Relay outputs	No.	>=4	
1.04	Detection Range	m		
1.05	Fieldbus Enabled	Yes / No	Yes	
1.06	Surge Protection Required	Yes / No	Yes	
1.07	Local Indication Required	Yes / No	Yes	
1.08	Additional datasheet from manufacturer included with tender	Yes / No	Yes	
2	ELECTROMAGNETIC FLOW METERS			
2.01	Manufacturer			
2.02	Model			
2.03	Flange Size	mm / DN	As indicated on the P&ID	
2.04	Flow range	m³/hr	Various	
2.05	PN Rating		As indicated on the P&ID	
2.06	Number of Relay outputs	No.		
2.07	Fieldbus Enabled	Yes / No		
2.08	Local Indication Required	Yes / No	Yes	
2.09	Surge Protection Required	Yes / No	Yes	
2.10	Additional datasheet from manufacturer included with tender	Yes / No	Yes	
3	INSERTION TYPE ULTRASONIC FLOW METER			
3.01	Manufacturer			
3.02	Model			
3.03	Pipe Diameter	mm / DN	DN > 600	
3.04	Flow range	m³/hr		
3.05	PN Rating		As indicated on the P&ID	
3.06	Number of Relay outputs	No.		
3.07	Fieldbus Enabled	Yes / No	No	
3.08	Local Indication Required	Yes / No	Yes	
3.09	Surge Protection Required	Yes / No	Yes	
3.10	Additional datasheet from manufacturer included with tender	Yes / No	Yes	
4	PRESSURE TRANSMITTERS			
4.01	Manufacturer			
4.02	Sensor Model			
	TECHNICAL DATA SHEET NO 29 continued			
4.03	Transmitter Model			

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4.04	Detection Range	kPa		
4.05	Number of Relay outputs	No.		
4.06	Fieldbus Enabled	Yes / No	No	
4.07	Surge Protection Required	Yes / No	Yes	
4.08	Local Indication Required	Yes / No	No	
4.09	Additional datasheet from manufacturer included with tender	Yes / No	Yes	
5	TURBIDITY METER			
5.01	Manufacturer			
5.02	Sensor Model			
5.03	Transmitter Model			
5.04	Detection Range	NTU		
5.05	Number of Relay outputs	No.		
5.06	Fieldbus Enabled	Yes / No	No	
5.07	Surge Protection Required	Yes / No	Yes	
5.08	Local Indication Required	Yes / No	Yes	
5.09	Additional datasheet from manufacturer included with tender	Yes / No	Yes	

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DATA SHEET No.TD-CI-004
INSTRUMENTATION

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
6	TORQUE SENSORS			
6.01	Manufacturer			
6.02	Model			
6.03	Type		Rotary inline	
6.04	Measured unit	m/s		
6.05	Process connection			
6.06	Number of Relay outputs	No.		
6.07	Fieldbus Enabled	Yes / No	No	
6.08	Local Indication Required	Yes / No	No	
6.09	Surge Protection Required	Yes / No	Yes	
6.10	Additional datasheet from manufacturer included with tender	Yes / No	Yes	
7	LEVEL SWITCHES: FLOAT			
7.01	Manufacturer			
7.02	Model			
7.03	Type			
7.04	Additional datasheet from manufacturer included with tender	Yes / No	Yes	
8	LIMIT SWITCHES			
8.01	Manufacturer			
8.02	Model			
8.03	Type		Inductive Proxy	
8.04	Additional datasheet from manufacturer included with tender	Yes / No	Yes	
9	PRESSURE SWITCHES			
9.01	Manufacturer			
9.02	Model			
9.03	Type			
10	FLOW SWITCHES			
10.01	Manufacturer			
10.02	Model			
10.03	Type			
10.04	Additional datasheet from manufacturer included with tender	Yes / No	Yes	
11	TORQUE SWITCHES			
11.01	Manufacturer			
11.02	Model			
11.03	Type		Inductive Proxy	
12	SURGE PROTECTION			
12.01	Instrument Power Supply Circuits - Manufacturer			
12.02	Instrument Power Supply Circuits - Model			
12.03	Instrument Signal Loop - Manufacturer			
12.04	Instrument Signal Loop Circuits - Model			
12.05	Instrument Transducer Loop - Manufacturer			
12.06	Instrument Transducer Loop Circuits - Model			
13	INSTRUMENT AND CONTROL CABLE JUNCTION			
13.01	Manufacturer			
13.02	Material of Construction: 1.6mm Mild Steel / 2.0mm Mild Steel / Electro Galvanized / Stainless Steel / 3CR12 / Fibre Glass		3CR12	
13.03	Epoxy Powder Coated	Yes / No	Yes	
13.04	Colour		Siemens Grey	
13.05	IP Rating (Indoor)	IP	65	
13.06	IP Rating (Outdoor)	IP	65	

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Contractor

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TECHNICAL DATA SHEET NO 29 continued
INSTRUMENTATION

	DESCRIPTION	UNIT	SPECIFIED	OFFERED
14	INSTRUMENT TRANSMITTER HOUSINGS			
14.01	Manufacturer			
14.02	Steel / Electro Galvanized / Stainless Steel / 3CR12 / Fibre		3CR12	
14.03	Epoxy Powder Coated	Yes / No	Yes	
14.04	Colour		Siemens Grey	
14.05	IP Rating (Indoor)	IP	N/A	
14.06	IP Rating (Outdoor)	IP	65	
15	SUPPLEMENTARY DETAILS			

.....
SIGNATURE OF TENDERER

.....
DATE

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DATA SHEET No. DS-II-0004
TELEMETRY

[illegible]

Regardless of any information provided in this technical data sheet, the equipment to be provided will comply with the specified

Name (Print):

Signature:

THE CONTRACT

Part C1: Agreement and Contract Data

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C1.2 Contact Data

Witness 2

CONTRACT

PART C2: PRICING DATA

- C2.1 Pricing Instructions
- C2.2 Bill of Quantities

Employer	Witness 1	Witness 2	Contractor	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 Engineer 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 ^[1]. 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 An amount or rate shall be entered against each item in the Bill of Quantities, whether or not quantities are stated. An item against which no amount or rate is entered will be considered to be covered by the other amounts or rates in the Bill.

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.

Should the Bidder group a number of items together and bid one sum for such group of items, the single bidden sum shall apply to that group of items and not to each individual item, or should he indicate against any item that full compensation for such item has been included in another item, the rate for the item

^[1] The standard system of measurement of civil engineering quantities published by the South African Institution of Civil Engineers.

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included in another item shall be deemed to be nil.

The billed 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.

- 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 billed rate of the (same) item

Sum : An amount billed 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	=	meganeutron
MN-m	=	meganeutron-metre
PC Sum	=	Prime Cost Sum
Prov Sum	=	Provisional Sum

11. Descriptions in the Bills of Quantities are abbreviated and comply generally with those in the Standardised Specifications.

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12. All prices and rates entered in the Bill of Quantities must be **excluding Value Added Tax (VAT)**. VAT will be added last on the summary page of the Bill of Quantities.

Employer

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Witness 2

Contractor

Witness 1

Witness 2

C2.2 BILL OF QUANTITIES

SUMMARY OF SECTIONS		
BROUGHT FORWARD FROM SECTION TOTALS		
Section no	Description	Amount (Rand)
CIVIL WORKS		
1	Preliminary and General	
2	Bulk Earthworks	
3	New Inlet Works and Roof over Screenings area and associated Buildings	
4	New Biological Reactor 8ML	
5	New 2 x 26m diameter Secondary Clarifiers	
6	New Chlorine Contact Channels	
7	New Sludge Drying Beds	
8	New WAS Pump Station	
9	New Chlorine Storage and Dosage Building	
10	New MCC and Generator Building	
11	Rest Room and Storage Building and Lime Dosage Building at Inlet Works	
12	Nightsoil Disposal Point	
13	Internal Interconnecting Pipework	
14	Roads and Stormwater Management and Miscellaneous Work	
Sub Total 1 Civil Works		
MECHANICAL WORKS		
15	Screens, Screenings Conveyor and Compactor	
16	Grit Classifier	
17	Mixers	
18	Surface Aerators	
19	Clarifier Rotating Bridges	
20	Pumps and Associated Pipework and Specials	
21	Axial Flow Vortex Pumps; RAS and a-Recycle	
22	Weirs and Sluice Gates	
23	Lime dosing and storage Equipment	
24	Chlorination Equipment	
25	Flow measurement and Recording Equipment	
26	Miscellaneous Items	
Sub Total 2 Mechanical Works		

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ELECTRICAL AND INSTRUMENTATION WORKS		
E1	Bulk Supply	
E2	Back-Up Generator	
E3	LV Switchgear & Control Assemblies	
E4	LV Cables	
E5	Cable Supports	
E6	Building Electrical	
I1	Instrumentation, Control & Data Cables	
I2	Programmable, Logic Controllers	
I3	Industrial Network	
I4	Telemetry	
I5	SCADA, remote monitoring & Reporting	
I6	Instrumentation	
Sub Total 3 Electrical and Instrumentation Works		
TOTAL 1 (SUB TOTAL 1 + SUB TOTAL 2 + SUB TOTAL 3)		
10% Contingencies		
TOTAL 2 (Total 1 + Contingencies)		
15% Value Added tax		
GRAND TOTAL (Total 2 + VAT) TO THE FORM OF OFFER		

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Item No	Payment Ref	Description	Unit	Qty	Rate R c	Amount R c
1	SABS 1200 A PSA	<u>SECTION 1 : PRELIMINARY AND GENERAL</u>				
1.1	8.3	FIXED CHARGE AND VALUE RELATED ITEMS:				
1.1.1	8.3.1	Contractual Requirements	Sum	1	R	R
1.1.2	PSA 8.3.2.1 PSAB	Facilities for Engineer: a) Engineer's offices, Office Furniture and Carpets as per Specifications for RE and 2 Assistants	Sum	1	R	R
		b) Combination photocopying fax & telephone machine	Sum	1	R	R
		c) Nameboards (2 No)	Sum	1	R	R
		d) Survey assistant and survey materials	Sum	1	R	R
		e) Boardroom for meetings (20 people) including conference table and chairs	Sum	1	R	R
		f) Safety equipment, including hard hats, removable revolving orange light for vehicles & reflective vests for 3	Sum	1	R	R
1.1.3	8.3.2.2	Facilities for Contractor: a) Offices and storage sheds	Sum	1	R	R
		b) Workshops	Sum	1	R	R
		c) Living accommodation	Sum	1	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate R c	Amount R c
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
		d) Ablution and latrine facilities	Sum	1	R	R
		e) Tools and equipment	Sum	1	R	R
		f) Water supplies, electric power and communications	Sum	1	R	R
		g) Dealing with water	Sum	1	R	R
		h) Access	Sum	1	R	R
		i) Plant	Sum	1	R	R
1.1.4	8.3.3	Other fixed-charge obligations	Sum	1	R	R
1.1.5	8.3.3	Environmental Specification	Sum	1	R	R
1.1.6	8.3.3	Safety plan	Sum	1	R	R
1.1.7	8.3.4	Removal of site establishment	Sum	1	R	R
1.1.8	PSA 8.3.5	Security of Contractor's plant and personnel	Sum	1	R	R
1.2	PSA 8.4	TIME RELATED ITEMS				
1.2.1	8.4.1	Contractual Requirements	Month	18	R	R
1.2.2	PSA 8.4.2.1	Facilities for Engineer:				
	PSAB	a) Office and office Furniture for 3	Month	18	R	R
		b) Combination photocopying fax & telephone machine	Month	18	R	R
		c) Nameboards (2 No)	Month	18	R	R
		d) Survey assistant and survey materials	Month	18	R	R
		e) Boardroom for meetings (20 people) including conference table and chairs	Month	18	R	R
		f) Safety equipment, including hard hats, removable revolving orange lights for vehicle & reflective vests for 3	Month	18	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate R c	Amount R c
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
1.2.3	8.4.2.2	Facilities for Contractor:				
		a) Offices and storage sheds	Month	18	R	R
		b) Workshops	Month	18	R	R
		c) Living accommodation	Month	18	R	R
		d) Ablution and latrine facilities	Month	18	R	R
		e) Tools and equipment	Month	18	R	R
		f) Water supplies, electric power and communications	Month	18	R	R
		g) Dealing with water	Month	18	R	R
		h) Access	Month	18	R	R
		i) Plant	Month	18	R	R
1.2.4	8.4.3	Supervision for duration of construction	Month	18	R	R
1.2.5	8.4.4	Company and head office overhead costs for the duration of the contract	Month	18	R	R
1.2.6	8.4.5	Other time-related obligations	Month	18	R	R
1.2.7	8.4.5	Environmental specification	Month	18	R	R
1.2.8	8.4.5	Implementation of Safety plan as per OHS Act	Month	18	R	R
1.2.9	8.4.5	Security of Contractor's plant and personnel	Month	18	R	R
1.2.10		Payment of CLO @ 6000.00 per month	Prov Sum	18	R 6,000.00	R 108,000.00
1.2.11		PSC Monthly Disbursements @ R140.00 per member sitting	Prov Sum	18	R 700.00	R 12,600.00
1.2.12		Handling cost for 1.2.10 & 1.2.11 above	%	R120,600.00	_____ %	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate R c	Amount R c
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
1.3	8.4.5, PSB 2.14, PSB2.24.13.1	All time related items for period covering attendance of mechanical and electrical contracts during the defects liability period of this contract- responsibility for maintaining all equipment, including controls associated with the equipment in a manner which will ensure that the equipment is ready for operation at all times- Routine Operation & Maintenance	Month	18	R	R
1.4		Posters, signs, safety boards, notifications, agreements and documentation for site office as per OHAS specifications	Sum	1	R	R
1.5		Legal Safety Appointments	Sum	1	R	R
1.6		Supply and maintain fire fighting equipment, first aid kits and visitor PPE for contract duration	Sum	1	R	R
1.7	8.5	Sums stated provisionally by the Engineer				
		Testing				
		b) Material Testing to check testing done by contractor	Prov sum	1	R100,000.00	R 100,000.00
		Other testing requirements				
1.8		a) Allow for attendance to all factory inspections, such as travel expenses, accommodation and per diem.	Prov Sum	1	R50,000.00	R 50,000.00
		b) Electrical - Allow to test and commission the complete installation in the presence of the engineer and the client's representative and hand over for commercial use	Prov Sum	1	R50,000.00	R 50,000.00
1.9		Training of Labourers	Prov Sum	1	R50,000.00	R 50,000.00
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL SECTION 1 CARRIED FORWARD TO SUMMARY OF SCHEDULES						R
1.10		Provisional Sum for costs hiring training venue and labour payment during training	Prov Sum	1	R 5,000.00	R 5,000.00
1.11		Accommodation for engineer's site personnel	Prov Sum	1	R300,000.00	R 300,000.00
1.12		Additional Surveys required by Engineer	Prov Sum	1	R100,000.00	R 100,000.00
1.13		Allow for all additional tests and compliance for registration of plant and WUL	PC Sum	1	R200,000.00	R 200,000.00
1.14		Mechanical & Electrical Specialist (Design approval, quality control, supervision and certification)	Prov Sum	1	R500,000.00	R 500,000.00
1.15		Specialist Services as Specified by the Engineer and certification by professionals	Prov Sum	1	R300,000.00	R 300,000.00
1.16		Handling cost for 1.3 to 1.15 above	%	R1 655,000.00	_____ %	R
1	TOTAL SECTION 1 CARRIED FORWARD TO SUMMARY OF SCHEDULES					R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
2		<u>SECTION 2: SITE CLEARANCE AND BULK EARTHWORKS</u>				
2.1	SANS 1200 C	SITE CLEARANCE				
2.1.1	8.2.1	Clear site	ha	2.0	R	R
2.1.2		Remove topsoil, as designated by Engineer, to nominal depth of 100mm and stockpile	m³	1000	R	R
2.1.3	PSC3	Cutting, stockpiling, drying and burning of vegetation from sludge lagoons	m²	7300	R	R
2.2	SABS 1200 D	EARTHWORKS				
	PCS 2	Bulk earthworks for Structures				
	8.3.2 (a)	Excavate and trim in all materials to the level of blinding layer and spread and compact on site at designated area, unsuitable or excess backfill material from:				
2.2.1		Cut to stockpile	m³	1000	R	R
2.2.2		Cut to fill	m³	11000	R	R
2.2.3		Cut to spoil	m³	6600	R	R
		Extra over Items 2.2.1 to 2.2.3 for excavation in:				
2.2.4		Intermediate material	m³	10000	R	R
2.2.5		Hard Rock material	m³	4000	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FROM PREVIOUS PAGE						R
	PCS1	Exploratory Holes				
		Excavate exploratory holes in soft material to determine existing services:				
2.2.7		0 - 2m deep	No	6	R	R
2.2.8		2 - 4m deep	No	3	R	R
2.2.9		Backfilling and compaction of exploratory holes	m³	40	R	R
2.3	PCS 3	PREPARATION OF SLUDGE LAGOON				
		Remove sludge from Lagoon to sludge drying beds:				
2.3.1		Supply pump, generator and flexible hosing	Sum	1	R	R
2.3.2		Pump liquid sludge	hours	6	R	R
2.3.3		Remove by machines	m³	400	R	R
2.4		Miscellaneous Items				
2.4.1		Provisional Sum for the cost of removing certain trees, shrubs or bulbs, conserving them (established on site for this purpose or elsewhere) and replant them upon completion.	Prov. Sum	1	R35 000.00	R35 000.00
2.4.2		Site landscaping and grassing (implemented per instruction by the Engineer)	Prov. Sum	1	R100 000.00	R100 000.00
2.4.3		<u>Handling cost by contractor on item 2.4.1 and 2.4.2 above</u>	%	—	R	R
2	TOTAL SECTION 2 CARRIED FORWARD TO SUMMARY OF SCHEDULES					R

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3		<u>SECTION 3: NEW INLET WORKS</u>				
3.1	SABS 1200 D	EARTHWORKS				
		Restricted Excavation				
3.1.1		Excavate and trim in all material and place at stockpile on site for reuse or backfill lagoon as specified	m³	130	R	R
	8.3.2(b)	Extra -over item 3.1.1:				
3.1.2		Intermediate material	m³	20	R	R
3.1.3		Hard Rock material	m³	5	R	R
		Restricted Backfill				
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FROM PREVIOUS PAGE						R
3.1.4	SANS 1200G	Extra over items 3.1.2 and 3.1.3 for backfill with material from stockpile	m³	40	R	R
3.1.5		Extra over items 3.1.2 and 3.1.3 for backfill and compaction in lagoon	m³	90	R	R
3.2		CONCRETE (Structural)				
3.2.1		8.4.2 Blinding layer 50mm thick in 15 Mpa/19 mm concrete	m²	180	R	R
3.2.2		Walkway around inlet works in 15Mpa/19mm concrete	m³	65	R	R
3.2.3		20mm (1:4) Cement mortar screed	m²	2	R	R
		8.4.3 Strength concrete : 20 Mpa/19mm				
3.2.4		- Slab for screenings screw press, grit classifier, skips	m³	12	R	R
		8.4.3 Strength concrete : 35 Mpa/19mm				
3.2.5		- Floor slab	m³	115	R	R
3.2.6		Walls	m³	45	R	R
3.2.7		Columns and footings	m³	9	R	R
3.2.8		Mass Concrete : 15 Mpa/19mm	m³	1	R	R
3.3	8.1.1	FORMWORK				
		Rough				
3.3.1	8.2.1	- Walls below ground level, vertical plane	m²	65	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit		Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
3.3.2		Horizontal narrow widths up to 250mm wide	m ²	5	R	R
3.3.3		Vertical curved: radii between 700 and 2515mm.	m ²	24	R	R
		Smooth				
3.3.4	8.2.2	Vertical plane to walls	m ²	170	R	R
3.3.5		Vertical curved; radii between 950-1050mm	m ²	38	R	R
3.3.6		Conical:Radii between 150 and 1215mm	m ²	2	R	R
3.3.7		Soffits of walkways	m ²	12	R	R
3.3.8		Column sides for shelter roof	m ²	65	R	R
3.3.9		Vertical narrow widths up to 200mm wide	m	21	R	R
3.4	8.2.6	BOX OUT HOLES / FORM VOIDS				
		Circular up to 1,0m diameter for depth over and up to :				
3.4.1		0m to 0.3m	No	3	R	R
3.4.2		Circular up to 100mm diameter for depths up to 250mm	No	2	R	R
3.5		REINFORCEMENT				
3.5.1	8.1.2	Mild steel bars 10mm diameter	t	1	R	R
3.5.2	8.3.1	High-tensile steel bars 10 - 32mm diameter	t	17	R	R
3.5.3		Mesh Ref 245 in slab for screenings, skips etc	m ²	83	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit		Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
3.6	8.4.4	UNFORMED SURFACE FINISHES				
		Wood-floated finish				
3.6.1		Top of channel walls	m²	38	R	R
3.6.2		Top of walkways	m²	90	R	R
		Steel-floated finish				
3.6.3		Floors of channel and top of screeds	m²	77	R	R
3.6.4		Create 45° degree overflow weirs	m²	10	R	R
3.7	8.3.1	GROUTING				
3.7.1		Puddle flanges IW1 and IW2	No	2	R	R
3.8		PIPEWORK				
3.8.1		Schedule IW1	No	1	R	R
3.8.2		Schedule IW2	No	1	R	R
3.9	SANS 1200 HA	STRUCTURAL STEELWORK (Small Works)				
3.9.1		Handrailings as specified complete with stainless steel holding down bolts	m	26	R	R
3.9.2		Provisional sum for a <u>shelter</u> over the screenings area, rest room and storage building and lime storage and dosage building. PS columns measured under concrete	Psum	1	R 250 000.00	R 250 000.00
3.9.3		<u>Handling cost by contractor on item 3.9.2 above</u>	%	—	R	R
3.10		JOINTS				
3.10.1		Type 2: Horizontal expansion joint	m	4	R	R
3.10.2		Type 4: Vertical joint	m	4	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit		Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
3.11		MISCELLANEOUS				
3.11.1		Allow a provisional sum for small items omitted from this section	Prov. Sum	1	R 30,000.00	R 30,000.00
3.11.2		Watertightness testing	Sum	1	R	R
3.11.3		Venturi flumes with 270mm throat width	No	2	R	R
3.11.4		Provisional sum Temporary Works- protection of existing structures, pipelines until completion to enable operation of the existing Inlet Works (per instruction issued by the Engineer)	Psum	1	R 250 000.00	R 250 000.00
3.11.5		Handling cost by contractor on item 3.11.4 above	%	—	R	R
TOTAL SECTION 3 CARRIED FORWARD TO SUMMARY						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
4		<u>SECTION 4: 8ML BIOLOGICAL REACTOR</u>				
4.1	SABS 1200 D	EARTHWORKS				
		Restricted Excavation				
4.1.1		Excavate and trim in all material and place at stockpile on site for reuse or spread excess unused material on site	m³	960	R	R
	8.3.2(b)	Extra -over item 4.1.1 for:				
4.1.2		Intermediate material	m³	470	R	R
4.1.3		Hard Rock material	m³	150	R	R
		Restricted Backfill				
4.1.4		Extra over item 4.1.1 for backfill with material from stockpile	m³	960	R	R
4.2	SANS 1200G	CONCRETE (Structural)				
4.2.1	8.4.2	Blinding layer 50mm thick in 15 Mpa/19 mm concrete	m²	380	R	R
4.2.2		No fines concrete: 15Mpa/19mm	m³	216	R	R
	8.4.3	Strength concrete : 35 Mpa/19mm				
4.2.3		Floor slab	m³	430	R	R
4.2.4		Walls and footings	m³	650	R	R
4.2.5		Columns	m³	9	R	R
4.2.6		Pump and Division Boxes and Elevated Channels	m³	39	R	R
4.2.7		Elevated platforms, walkways and staircases	m³	85	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FROM PREVIOUS PAGE						R
4.2.8		Mass Concrete: 15 Mpa/19mm	m³	2	R	R
4.3	8.1.1	FORMWORK				
		Rough				
	8.2.1	Curved Walls and footings below ground at radii of between:				
4.3.1		13,2m and 28,4m	m²	2675	R	R
4.3.2	8.2.1	Vertical Wall and footings below ground level, vertical	m²	55	R	R
4.3.3		Horizontal narrow widths up to 200mm wide:				
4.3.4		In expansion joints - Vertical plane	m²	60	R	R
4.3.5		In expansion joints - Radii between 6m and 20,8m	m²	140	R	R
		Smooth				
4.3.6		Vertical at radius of 0,15m for columns	m²	9	R	R
4.3.7		Vertical at radii of between 13,5m and 28,1m	m²	2300	R	R
4.3.8	8.2.2	Vertical plane to walls over 350mm wide	m²	780	R	R
4.3.9		Inclined formwork to underside of staircases	m²	12	R	R
4.3.10		Soffits of walkways and platforms	m²	265	R	R
4.3.11		Vertical narrow widths up to 350mm wide	m	180	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FROM PREVIOUS PAGE						R
4.4	8.2.6	BOX OUT HOLES / FORM VOIDS				
4.4.1		Small, circular up to 400mm diameter for depth up to 350mm for aerators and stirrers	No	9	R	R
4.4.2		Small, circular up to 600mm diameter for depth up to 350mm for manholes in platforms	No	5	R	R
4.4.3		Small, circular up to 1m diameter for depth up to 250mm for ND600 pipes	No	1	R	R
4.4.4		Small, circular up to 800mm diameter for depth up to 300mm for ND500 pipes	No	1	R	R
4.4.5		Small, circular up to 700mm diameter for depth up to 250mm for 400NB pipes	No	2	R	R
4.4.6		Small, circular up to 500mm diameter for depth up to 250mm for 80 to ND300 pipes	No	2	R	R
4.4.7		Small square pockets up to 150x250mm for 200mm depth	No	20	R	R
4.5		REINFORCEMENT				
4.5.1	8.3.1	High-tensile steel bars 10 - 32mm diameter	t	145	R	R
4.6	8.4.4	UNFORMED SURFACE FINISHES				
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
		Wood-floated finish				
4.6.1		Top of walls	m ²	100	R	R
4.6.2		Top of walkways, platforms and steps	m ²	245	R	R
		Steel-floated finish				
4.6.3		Form overflow weirs to specified tolerances	m	25	R	R
4.7	8.3.1	GROUTING				
4.7.1		300mm diameter puddle pipe: No BR1	No	2	R	R
4.7.2		300mm diameter puddle pipe: No BR3	No	2	R	R
4.7.3		400mm diameter puddle pipe: No BC1	No	2	R	R
4.7.4		500mm diameter puddle pipe : No BI1	No	1	R	R
4.8		PIPEWORK				
4.8.1		Schedule BI1	No	1	R	R
4.8.2		Schedule BI2	No	1	R	R
4.8.3		Schedule BC1	No	2	R	R
4.8.4		Schedule BC2	No	2	R	R
4.8.5		Schedule BC3	No	2	R	R
4.8.6		Schedule BC4	No	2	R	R
4.8.7		Schedule BR1	No	2	R	R
4.8.8		Schedule BR2	No	2	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
4.8.9	SANS 1200 HA	Schedule BR3	No	2	R	R
4.8.10		Schedule BR4	No	2	R	R
4.8.11		Schedule BR5	No	2	R	R
4.9		STRUCTURAL STEELWORK (Small Works)				
4.9.1		Handrailing, hot dipped galvanized, complete with stainless steel HD bolts.	m	261	R	R
4.10		JOINTS				
4.10.1		Type 2: Floor to walls expansion joints	m	520	R	R
4.10.2		Type 3: Contraction joints in floors	m	340	R	R
4.11		MISCELLANEOUS				
4.11.1		Allow a provisional sum for small items omitted from this section	Prov. Sum	1	R 400,000.00	R 400,000.00
4.11.2		Watertightness testing	Sum	1	R	R
4.11.3		Provisional amount for bearing pads under bridge supports	Prov. Sum	1	R650,000.00	R 650,000.00
4.11.4		75mm Diameter HDPE pipe for cable conduit with wire, placed into position	m	180	R	R
4.12		SUB-SOIL DRAINAGE				
4.12.1		uPVC non-perforated pipes, 110mm diameter, in Class C bedding	m	315	R	R
4.12.2		110mm Diameter Y-coupling	No	7	R	R
4	TOTAL SECTION 4 CARRIED FORWARD TO SUMMARY					R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
5		<u>SECTION 5: CLARIFIERS 2 x 26m diameter</u>				
5.1	SABS 1200 D	- EARTHWORKS				
		Restricted Excavation				
5.1.1		Excavate and trim in all material and place at stockpile on site for reuse and spread excess unused material on site or unused ponds	m³	1350	R	R
	8.3.2(b)	Extra -over item 5.1.1 for				
5.1.2		Intermediate material	m³	1500	R	R
5.1.3		Hard Rock material	m³	700	R	R
		Restricted Backfill				
5.1.4		Extra over item 5.1.1 for backfill with material from stockpile	m³	730	R	R
	SABS 1200 G	CONCRETE (Structural)				
5.2	8.1.3	CONCRETE				
5.2.1	8.4.2	Blinding layer 50mm thick in 15 Mpa/19mm concrete	m²	1182	R	R
5.2.2		No fines concrete : 15 MPa/19mm	m³	100	R	R
5.2.3		Mass concrete: 20 MPa/19mm	m³	1	R	R
	8.4.3	Strength concrete : 35 Mpa/19mm				
5.2.4	PSG3.4.4	Wall footings and centre column footing	m³	115	R	R
5.2.5		Centre Column	m³	4.5	R	R
5.2.6		Walls and effluent launder	m³	272	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Pay ment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
5.2.7		Floors	m ³	206	R	R
5.2.8		Outlet boxes	m ³	6.5	R	R
5.2.9		50mm (1:4) Cement mortar screed with steelfloat, shaped with mechanical scrapers	m ²	1026	R	R
5.2.10		Varying depth (1:4) cement mortar screed in channel and outlet box finished with steelfloat	m ³	10	R	R
5.3	8.1.1	FORMWORK				
		Rough				
	8.2.1	Walls below ground at radii of between:				
5.3.1		25,3m and 27,3m	m ²	751	R	R
5.3.2		7.78m (circular expansion joint in floor)	m ²	20	R	R
5.3.3		2.7m (center column footing)	m ²	71	R	R
5.3.4		Vertical Wall below ground level for box	m ²	17	R	R
5.3.5		In expansion joints - Vertical plane	m ²	102	R	R
		Smooth				
5.3.6		Vertical at radii of between 0.45m and 0.7m for column	m ²	32	R	R
5.3.7		Vertical at radii of between 12.25m and 13.3m (wall and effluent launder)	m ²	1026	R	R
5.3.8		Walls vertical plane (boxes)	m ²	28	R	R
5.3.9		Soffit to channel (effluent launder) and box	m ²	123	R	R
5.3.10		Conical for centre sludge accumulation sump	m ²	47	R	R
5.3.11		Conical for centre column head	m ²	2	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
5.4	8.2.6	BOX OUT HOLES/FORM VOIDS				
5.4.1		Box out holes/form voids, large, other shapes, area 0.1 - 0.36m ² for depths over and up to 0m - 0.25m	No	20	R	R
5.5		REINFORCEMENT				
5.5.1	8.1.2	Mild steel bars 10mm diameter	t	4	R	R
5.5.2	8.3.1	High-tensile steel bars 10 - 32mm diameter	t	83	R	R
5.6	8.4.4	UNFORMED SURFACE FINISHES				
		Wood floated finish				
5.6.1		To top of walls	m ²	52	R	R
		Steel floated finish				
5.6.2		To top of screeds in outlet boxes and overflow channel	m ²	100	R	R
5.6.3		Special finish to top of overflow weir	m	156	R	R
5.7	8.5	JOINTS				
5.7.1		Type 3: Floor expansion joint	m	310	R	R
5.7.2		Types 2 : Wall/floor contraction joint	m	196	R	R
5.7.3		Cancelled	m			
5.8	8.3.1	GROUTING				
		Grout in (Pipe supply measured elsewhere):				
5.8.1		300NB pipe (CR3)	No	2	R	R
5.8.2		400NB pipe (CF2, CF3, CF4)	No	2	R	R
5.8.3		Cancelled	No	0		
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Item No	Pay ment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
5.9		STEEL PIPEWORK				
		Supply steel in-and outlet pipes and specials				
5.9.1		Schedule CF1	No	0	R	R
5.9.2		Schedule CF2	No	2	R	R
5.9.3		Schedule CF3	No	2	R	R
5.9.4		Schedule CF4	No	2	R	R
5.9.5		Schedule CF5	No	2	R	R
5.9.6		Schedule CF6	No	2	R	R
5.9.7		Schedule CF7	No	2	R	R
5.9.8		Schedule CR1	No	2	R	R
5.9.9		Schedule CR2	No	2	R	R
5.9.10		Schedule CR3	No	4	R	R
5.9.11		Schedule CR4	No	2	R	R
5.9.12		Schedule CR5	No	2	R	R
5.10		CABLE CONDUIT				
5.10.1		75mm Diameter HDPe pipe for cable conduit with wire, placed into position	m	45	R	R
5.11		SUB-SOIL DRAINAGE				
5.11.1		ND100 pipe	m	32	R	R
5.12		MISCELLANEOUS				
5.12.1		Allows a provisional sum for small items omitted from this section (implemented per instruction issued by the Engineer)	Prov. Sum	1	R 500,000.00	R 500,000.00
5.12.2		Watertightness testing of units	Sum	1	R	R
5	TOTAL SECTION5 CARRIED FORWARD TO SUMMARY					R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
6		SECTION 6: NEW CHLORINE CONTACT CHANNELS				
6.1	SAB S 1200 D	EARTHWORKS				
		Restricted Excavation				
6.1.1		Excavate and trim in all material and place at stockpile on site	m³	750	R	R
	8.3.2(b)	Extra -over item 6.1.1				
6.1.2		Intermediate material	m³	300	R	R
6.1.3		Hard Rock material	m³	30	R	R
		Restricted Backfill				
6.1.4		Extra over item 6.1.1 for backfill and compaction with material from stockpile	m³	161	R	R
6.2	SAN S 1200 G	CONCRETE (Structural)				
6.2.1	8.4.2	Blinding layer 50mm thick in 15 Mpa/19 mm concrete	m²	283	R	R
6.2.2		20mm (1:4) Cement mortar screed	m²	1	R	R
	8.4.3	Strength concrete : 35 Mpa/19mm				
6.2.3		Floor slab	m³	57	R	R
6.2.4		Walls	m³	85	R	R
6.2.5		Mass Concrete : 15 Mpa/19mm	m³	1	R	R
6.3	8.1.1	FORMWORK				
		Rough				
6.3.1	8.2.1	Walls below ground level, vertical	m²	148	R	R
6.3.2		In expansion joints up to 200 mm wide	m	50	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
		Smooth				
6.3.3	8.2.2	Vertical plane to walls	m ²	620	R	R
6.3.4		Vertical narrow widths up to 200mm wide	m	15	R	R
6.3.5		Special finish to overflow weir	m	1.5	R	R
6.4	8.2.6	BOX OUT HOLES / FORM VOIDS				
6.4.1		Small, circular up to 1m diameter for depth over and up to 0m to 0.25m	No	3	R	R
6.5		REINFORCEMENT				
6.5.1	8.1.2	Mild steel bars 10mm diameter	t	1	R	R
6.5.2	8.3.1	High-tensile steel bars 10 - 32mm diameter	t	13	R	R
6.6	8.4.4	UNFORMED SURFACE FINISHES				
		Wood-floated finish				
6.6.1		Top of walls	m ²	45	R	R
		Steel-floated finish				
6.6.2		Floors	m ²	241	R	R
6.6.3		Special finish to top of overflow weir	m	1.5	R	R
6.7	8.3.1	GROUTING				
6.7.1		525mm diameter concrete pipe	No	1	R	R
6.7.2		600mm diameter concrete pipe	No	1	R	R
6.7.3		300mm diameter concrete pipe	No	1	R	R
6.8		JOINTS				
6.8.1		Types 4: Expansion joints in wall	m	15	R	R
6.8.2		Type 2: Construction joints in floor	m	50	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
6.9		MISCELLANEOUS				
6.9.1		Allow a provisional sum for small items omitted from this section	Prov. Sum	1	R 100,000.00	R100,000.00
6.9.2		Provisional Sum: Temporary Works-allow for temporary chlorine dosing system during change-over and enable operation of the existing Works (implemented per instruction by the Engineer)	Prov. Sum	1	R 100,000.00	R100,000.00
6.9.3		Watertightness testing	Sum	1	R	R
6.10	SANS 1200 HA	STRUCTURAL STEELWORK (Small Works)				
6.10.1		Handrailing, hot dipped galvanised, complete with stainless steel HD bolts.	m	67	R	R
6	TOTAL SECTION 6 CARRIED FORWARD TO SUMMARY					R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
7		<u>SECTION 7: SLUDGE DRYING BEDS</u>				
7.1	SABS 1200 D	EARTHWORKS				
		Restricted Excavation				
7.1.1		Excavate and trim in all material and place at stockpile on site for reuse and spread excess unused material on site or unused ponds	m³	100	R	R
		Restricted Backfill				
7.1.2		Extra over item 7.1.1 for backfill with material from stockpile	m³	20	R	R
7.2	SABS 1200 G 8.1.3	CONCRETE				
		25/19mm Concrete in:				
7.2.1		Floors	m³	1350	R	R
7.2.2		Splash slabs	m³	25	R	R
7.3	PSG5.1	REINFORCEMENT				
7.3.1		High tensile welded mesh reinforcement ref 395 in standard sheets	m²	9600	R	R
7.4	8.4.4	UNFORMED SURFACE FINISHES				
7.4.1		Steel floated finish to floors	m²	8700	R	R
7.4.2		Wood floated finish to top of splash slabs	m²	52	R	R
7.5		BRICKWORK				
		Supply, cut, fit and build brickwork in 14 MPa cement in 10,5 MPa cement mortar				
		Face brick/Plaster brick				
7.5.1		One brick wall inner and outer face face brick	m²	736	R	R
7.5.2		Brick-on-edge on top of walls	m	1840	R	R
7.6		SUNDRIES				
7.6.1		Plastic sheets under floor: 250 micron USB Green	m²	9000	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
7.7		STEEL PIPEWORK				
		Supply steel pipes and specials:				
7.7.1		Schedule W1	No	43	R	R
7.7.2		Schedule W2	No	43	R	R
7.7.3		Schedule W3	No	44	R	R
7.7.4		Schedule W4	No	86	R	R
7.7.5		Schedule W5	No	43	R	R
7.7.6		Schedule W6	No	43	R	R
7.7.7		Schedule W7	No	43	R	R
7	TOTAL SECTION 7 CARRIED FORWARD TO SUMMARY					R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
8		<u>SECTION 8: WAS PUMP STATION</u>				
8.1	SABS 1200 D	EARTHWORKS				
		Restricted Excavation				
8.1.1		Excavate and trim in all material and place at stockpile on site	m³	4	R	R
	8.3.2(b)	Extra -over item 8.1.1				
8.1.2		Intermediate material	m³	1	R	R
8.1.3		Hard Rock material	m³	0		
		Restricted Backfill				
8.1.4		Extra over item 8.1.1 for backfill and compaction with material from stockpile	m³	2	R	R
8.2	SANS 1200G	CONCRETE (Structural)				
8.2.1	8.4.2	Blinding layer 50mm thick in 15 Mpa/19 mm concrete	m²	21	R	R
	8.4.3	Strength concrete : 25 Mpa/19mm				
8.2.2		Floor slab	m³	5.5	R	R
8.2.3		Mass Concrete : 15 Mpa/19mm	m³	1	R	R
8.3	8.1.1	FORMWORK				
		Smooth				
8.3.1	8.2.2	Vertical narrow widths up to 250mm wide	m	15	R	R
8.4	8.2.6	BOX OUT HOLES / FORM VOIDS				
8.4.1		Small, circular up to 300mm diameter for depth over and up to 0m to 0.25m	No	2	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
8.4.2	8.3.2	Allowance for manhole cover (1m diameter max)	No	1	R	R
8.5		REINFORCEMENT				
8.5.1		High-tensile welded mesh reinforcement-Type reference 245 in standard sheets	m²	21	R	R
8.6		MISCELLANEOUS				
8.6.1		Provisional allowance for items omitted from this section	Prov Sum	1	R 50,000.00	R 50,000.00
8	TOTAL SECTION 8 CARRIED FORWARD TO SUMMARY					R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
9		SECTION 9: NEW CHLORINE STORAGE AND DOSAGE BUILDING				
9.1		EARTHWORKS				
9.1.1	8.3.3(a)	Restricted excavation in all materials and use excavated material to backfill or dispose within free haul distance anywhere on site:				
		a) Strip footings for brick walls	m ³	16	R	R
		b) Column footings	m ³	1	R	R
		c) Cable trench foundations	m ³	1	R	R
		d) Under surface beds	m ³	6	R	R
9.1.2		Backfilling in 150mm layers to 98 % MOD AASHTO min density under surface beds and cable trench fillings				
		a) From material stockpiled on site	m ³	19	R	R
		b) From commercial sources or from borrow pits	m ³	1	R	R
9.2	SABS 1200 G	CONCRETE (STRUCTURAL)				
9.2.1		Concrete: 15 Mpa				
		a) Apron and ramp	m ³	5	R	R
9.2.2	8.4.2	Foundations: 20 MPa/19 mm concrete				
		a) Strip footings for brick walls	m ³	4	R	R
9.2.2		Strength concrete: 25 MPa/19mm				
		a) Surface bed	m ³	3	R	R
		b) Roof Slab	m ³	4	R	R
9.2.3	8.1.1	Formwork - Smooth				
		b) Soffit of roof slab	m ²	20	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FROM PREVIOUS PAGE						R
9.2.4	8.1.1	Formwork - Rough				
		a) Narrow widths for sides of column and cable trench footings up to 300mm wide	m ²	2	R	R
9.2.5	8.1.2	Reinforcement				
		a) High tensile steel bars not greater than 20 mm dia.	t	0.5	R	R
	8.3.2	b) High-tensile welded mesh reinforcement-Type reference 245 in standard sheets	m ²	20	R	R
9.3		BRICKWORK				
9.3.1		Brick Walls 220 mm facebrick outside	m ²	60	R	R
9.3.2		Brick Walls 220 mm both sides plaster brick	m ²	11	R	R
9.4		GENERAL BUILDING WORK				
9.4.1		Supply and form 20 mm thick screed to floors of building including power float finish	m ²	18	R	R
9.4.2		Supply and build in "Brickforce" brick reinforcing over openings in 270mm thick walls	m ²	6	R	R
9.4.4		Supply and install wooden doors with frames:				
		a) Type D1 as per drawing	No	1	R	R
		b) Type D2 as per drawing	No	1	R	R
9.4.5		Supply and install Winblok windows as per Drawing				
		a) Type W1	No	1	R	R
		b) Type W2	No	1	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
9.4.6		Supply and apply cement Plaster in single coat minimum 12mm thick to internal faces of brickwork and finishing with steel trowel	m²	54	R	R
9.4.7		Supply and install 375µm embossed steeped DPC	m²	24	R	R
9.5		RAINWATER GOODS				
9.5.1		125 x 100mm Chromadeck gutter	m	12	R	R
9.5.2		75mm diameter Chromadeck downpipes including bends and discharge shoes	m	4	R	R
9.6		ROOFS AND FIRE PROTECTION				
9.6.1		Supply and install prefabricated engineered timber roof trusses, including wall plates and necessary submission of inspection certificates, complete for the building as per drawings	sum	1	R	R
9.6.2		Supply and install FR420 Sisalation aluminium foil insulation as specified on drawing	m²	23	R	R
9.6.3		Supply and install Superseal 500 roof sheeting on 75/50mm SAP purlins on SAP gangnail trusses on 67 x 38mm wallplate	m²	45	R	R
9.6.4		Fire Protection: Supply and install complete with Backing boards and signage, 4.5kg Portable Fire Extinguishers	No	2	R	R
9.7		PAINTING AND PIPEWORK				
9.7.1		All exposed internal plastered wall surfaces to be coated 1x Plascon plaster primer followed by 2x Plascon Velvaglo polyurethane enamel (or similar approved) applied strictly in accordance with the manufacturer's instructions	m²	54	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
		TOTAL CARRIED FORWARD FROM PREVIOUS PAGE				R
9.8		MISCELLANEOUS				
9.8.1		Provisional sum for items omitted from this section (implemented per instruction by the Engineer)	Prov sum	1	R 300,000.00	R 300,000.00
9		TOTAL SECTION 9 CARRIED FORWARD TO SUMMARY				R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
10		<u>SECTION 10: NEW MCC AND GENERATOR BUILDING</u>				
10.1		EARTHWORKS				
10.1.1	8.3.3(a)	Restricted excavation in all materials and stockpile on site and dispose of excess material in sludge lagoon:				
		a) Strip footings for brick walls	m³	22	R	R
		b) Column footings	m³	15	R	R
		c) Cable trench foundations	m³	27	R	R
		d) Under surface beds	m³	17	R	R
10.1.2		Backfilling in 150mm layers to 98 % MOD AASHTO min density under surface beds and cable trench fillings				
		a) From material stockpiled on site	m³	45	R	R
		b) From commercial sources or from borrow pits	m³	1	R	R
10.2	SABS 1200 G 8.1.3	CONCRETE (STRUCTURAL)				
10.2.1	8.4.2	Foundations: 15 MPa/19 mm concrete				
		a) Strip footings for brick walls	m³	7	R	R
10.2.2		Strength concrete: 25 MPa/19mm				
		a) Surface bed and ramps	m³	8.5	R	R
		b) Column footings and columns	m³	5	R	R
		c) Staircase	m³	3	R	R
		d) Beams	m³	2.5	R	R
		f) Suspended Slab	m³	13	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
10.2.3	8.1.1	Formwork - Smooth				
	8.2.5	a) Vertical smooth for sides of beams and columns	m ²	60	R	R
		b) Soffit of roof slab	m ²	52	R	R
		c) Soffits of beams	m ²	11	R	R
		d) Soffit of staircase	m ²	9	R	R
		e) Narrow widths for sides of staircase	m ²	4	R	R
10.2.4	8.1.1	Formwork - Rough				
		a) Narrow widths for sides of column and cable trench footings up to 250mm wide	m ²	13	R	R
10.2.5	8.1.2	Reinforcement				
		a) High tensile steel bars not greater than 20 mm dia.	t	2.7	R	R
	8.3.2	b) High-tensile welded mesh reinforcement-Type reference 245 in standard sheets	m ²	63	R	R
10.3		BRICKWORK				
10.3.1		Brick Walls 220 mm facebrick outside	m ²	160	R	R
10.3.2		Brick Walls 220 mm both sides plaster brick	m ²	55	R	R
10.3.3		Brick walls 110mm single plaster brick	m ²	14	R	R
10.4		GENERAL BUILDING WORK				
10.4.1		Supply and form 20 mm thick screed to floors of building including power float finish	m ²	98	R	R
10.4.2		Supply and build in "Brickforce" brick reinforcing over openings in 270mm thick walls	m ²	5	R	R
10.4.3		Supply and install steel frame windows with 3mm glazing: Ref: C22H	No	2	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
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10.4.4		Supply and install transformer style doors in steel frames				
		a) D2:1524mm wide x 2438mm high double steel doors with louvres in bottom half	No	1	R	R
		b) D3: Single 813mm wide x 2032mm high single steel door.	No	1	R	R
10.4.5		Supply and apply cement Plaster in single coat minimum 12mm thick to internal faces of brickwork and finishing with steel trowel	m ²	186	R	R
10.4.6		Waterproof plaster to internal and external faces of cable trenches	m ²	55	R	R
10.4.7		Supply and install 375µm embossed steeped DPC	m ²	55	R	R
10.5		RAINWATER GOODS				
10.5.1		125 x 100mm Chromadeck gutter	m	17	R	R
10.5.2		75mm diameter Chromadeck downpipes including bends and discharge shoes	m	12	R	R
10.6		ROOFS AND FIRE PROTECTION				
10.6.1		Supply and install prefabricated engineered timber roof trusses, including wall plates and necessary submission of inspection certificates, complete for the building as per drawings	sum	1	R	R
10.6.2		Supply and install FR430 Sisalation aluminium foil insulation as specified on drawing	m ²	65	R	R
10.6.3		Supply and install superseal 500 roof sheeting on 75/50mm SAP purlins on SAP gangnail trusses on 76/38mm wall plate	m ²	65	R	R
10.6.4		Supply and install 225x10mm FC (Nutech) fascia board	m	30	R	R
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10.6.5		Fire Protection: Supply and install complete with Backing boards and signage, 4.5kg Portable Fire Extinguishers	No	2	R	R
10.7		PAINTING AND PIPEWORK				
10.7.1		All exposed internal plastered wall surfaces to be coated 1x Plascon plaster primer followed by 2x Plascon Velvagio polyurethane enamel (or similar approved) applied strictly in accordance with the manufacturer's instruction	m²	186	R	R
10.8		STEELWORK				
10.8.1		Supply and install galvanized handrailings as specified	m	21	R	R
10.9		MISCELLANEOUS				
10.9.1		Provisional sum for items omitted from this section (Implemented per instruction by the Engineer)	Prov sum	1	R 100,000.00	R 100,000.00
10.9.2		Provisional sum for sealing deck area and surface finish as instructed on site (Implemented per instruction by the Engineer)	Prov sum	1	R 75,000.00	R 75,000.00
10	TOTAL SECTION 10 CARRIED FORWARD TO SUMMARY					R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
11		SECTION 11: REST ROOM AND STORAGE BUILDING AND LIME DOSING BUILDING AT INLET WORKS				
		REST ROOM AND STORAGE BUILDING <u>Note that concrete columns, footings, ramp and roof has been measured under Inlet Works</u>				
11.1		EARTHWORKS				
11.1.1	8.3.3(a)	Restricted excavation in all materials and use excavated material to backfill or dispose within freehaul distance anywhere on site:				
		a) Strip footings for brick walls	m ³	15	R	R
		d) Under surface beds	m ³	6	R	R
11.1.2		Backfilling in 150mm layers to 98 % MOD AASHTO min density under surface beds and cable trench fillings				
		a) From material stockpiled on site	m ³	11	R	R
		b) From commercial sources or from borrow pits	m ³	5	R	R
11.2	SABS 1200 G	CONCRETE (STRUCTURAL)				
11.2.1	8.4.2	Foundations: 20 MPa/19 mm concrete a) Strip footings for brick walls	m ³	4	R	R
11.2.2		Strength concrete: 25 MPa/19mm a) Surface bed	m ³	3	R	R
11.2.3	8.1.2	Reinforcement a) High-tensile welded mesh				
	8.3.2	reinforcement-Type reference 245 in standard sheets	m ²	19	R	R
11.3		BRICKWORK				
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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
11.3.1		Brick Walls 220 mm facebrick outside	m ²	75	R	R
11.3.2		Brick Walls 220 mm both sides plaster brick	m ²	7	R	R
11.3.3		Brick Walls 110mm plaster brick	m ²	13	R	R
11.4		GENERAL BUILDING WORK				
11.4.1		Supply and form 20 mm thick screed to floors of building including power float finish	m ²	19	R	R
11.4.2		Supply and build in "Brickforce" brick reinforcing over openings in 270mm thick walls	m ²	2	R	R
11.4.3		Supply and install wooden doors with frames: a) Type D1 as per drawing	No	2	R	R
		b) Type D2 as per drawing	No	1	R	R
11.4.4		Supply and install steel frame windows as per Drawing with 3mm glazing a) Type W2	No	1	R	R
		b) Type W3	No	1	R	R
		c) Type W4	No	1	R	R
		d) Type W5	No	1	R	R
11.4.5		Supply and apply cement Plaster in single coat minimum 12mm thick to internal faces of brickwork and finishing with steel trowel	m ²	100	R	R
11.4.6		Supply and install 375µm embossed steeped DPC	m ²	19	R	R
11.5		PAINTING AND PIPEWORK				
11.5.1		All exposed internal plastered wall surfaces to be coated 1x Plascon plaster primer followed by 2x Plascon Velvagio polyurethane enamel (or similar approved) applied strictly in accordance with the manufacturer's instructions	m ²	100	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FORWARD TO NEXT PAGE						R
11.6		MISCELLANEOUS				
11.6.1		Provisional sum for items omitted from this section (Implemented per instruction by the Engineer)	Prov sum	1	R 150,000.00	R 150,000.00
11.7		LIME STORAGE AND DOSAGE BUILDING				
11.7.1		Allow a provisional sum for this building	Prov sum	1	R 300,000.00	R 300,000.00
11	TOTAL SECTION 11 CARRIED FORWARD TO SUMMARY					R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
12.1	SABS 1200 D	SECTION 12: NIGHTSOIL DISPOSAL POINT EARTHWORKS Restricted Excavation Excavate and trim in all material and place at stockpile on site Restricted Backfill Extra over item 12.1.1 for backfill and compaction with material from stockpile				
12.1.1			m ³	3	R	R
12.1.2			m ³	2	R	R
12.2	SANS 1200G	CONCRETE (Structural)				
12.2.1	8.4.2	Blinding layer 50mm thick in 15 Mpa/19 mm concrete	m ²	2	R	R
	8.4.3	Strength concrete : 25 Mpa/19mm				
12.2.2		Floor slab and walls and stairs	m ³	10	R	R
12.2.3		Mass Concrete : 15 Mpa/19mm	m ³	1	R	R
12.3	8.1.1	FORMWORK Rough				
12.3.1		Vertical plane	m ²	10	R	R
		Smooth				
12.3.2		Vertical plane	m ²	7	R	R
12.3.3		Circular within Radius 2 of 3m	m ²	8	R	R
12.4		REINFORCEMENT				
12.4.1	8.3.2	High-tensile welded mesh reinforcement-Type reference 245 in standard sheets	m ²	4.0	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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		TOTAL CARRIED FORWARD FROM PREVIOUS PAGE				R
12.5		BRICKWORK				
12.5.1		Brick Walls 220 mm both sides plaster brick	m ²	4	R	R
12.5.2		Supply and apply cement Plaster in single coat minimum 12mm thick to internal faces of brickwork and finishing with steel trowel	m ²	4	R	R
12.5.3		Form stairs in brickwork as per drawing	Sum	1	R	R
12.6		MISCELLANEOUS				
12.6.1		Provisional allowance for items omitted from this section (Implemented per instruction by the Engineer)	Prov Sum	1	R 100,000.00	R 100,000.00
12		TOTAL SECTION 12 CARRIED FORWARD TO SUMMARY				R

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13		SECTION 13: INTERCONNECTING PIPEWORK				
13.1		EXCAVATION				
	8.3.2(a)	Excavate in all materials for trenches backfill, compact, and dispose of surplus/unsuitable material, for pipes: From 40 up to 200mm Diameter for total trench depth (trench width 600mm)				
13.1.1		0.0 - 1.0m	m	160	R	R
13.1.2		1.0 - 2.0m	m	200	R	R
		From 250mm up to 450mm diameter for total trench depth (trench width 900mm) :				
13.1.3		0.0 - 1.0m	m	20	R	R
13.1.4		1.0 - 2.0m	m	68	R	R
		Fro 525mm up to 750mm diameter for trench depth (trench width 1300mm)				
13.1.5		0.0 - 1.0m	m	80	R	R
13.1.6		1.0 - 2.0m	m	138	R	R
	8.3.2(b)	Extra-over items 13.1.1 to 13.1.6 incl. for:				
13.1.7		Intermediate excavation	m ³	300	R	R
13.1.8		Hard rock excavation	m ³	50	R	R
13.2		EXCAVATION ANCILLARIES				
13.2.1	8.3.3.3	Compaction in road reserves	m ³	100	R	R
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13.3	SABS 1200G	PROVISION OF BEDDING Available from trench or within 2.0km freehaul				
13.3.1	8.2.1	Selected granular material	m³	67	R	R
13.3.2		Selected fill material	m³	421	R	R
13.4	SABS 1200L	MEDIUM PRESSURE PIPELINE Supply, handle, lay and bed and test with uPVC couplings:				
13.4.1		50mm diameter uPVC Class 9 (pipe 9)	m	10	R	R
13.4.2		75mm diameter uPVC Class 9 (pipe 8)	m	100	R	R
13.4.3		110mm diameter uPVC Class 9 (pipe 7)	m	225	R	R
13.4.4		375mm diameter uPVC Class 9 (pipe 3D)	m	4	R	R
13.4.5		525mm diameter uPVC Class 9 (pipe 2)	m	80	R	R
		50mm Diameter uPVC fittings:				
13.4.6		90 degree bend	No	1	R	R
		75mm Diameter uPVC fittings:				
13.4.7		90 degree bend	No	1	R	R
13.4.8		T pieces 75 x 75mm	No	6	R	R
		110mm Diameter uPVC fittings :				
13.4.9		45 degree bend	No	3	R	R
13.4.10		90 degree bend	No	1	R	R
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13.4.11	8.2.11	110 x 110mm T-piece	No	1	R	R
		ANCILLARIES				
13.4.12		Anchor/thrust blocks and pedestals including class 20/19 Mpa concrete and formwork	m³	4	R	R
13.5		SEWERS				
		Supply, handle, lay and bed uPVC Class 51 sewers				
		110mm diameter (pipes 12, 13)	m	27	R	R
		Supply, handle, lay and bed and test, Spigot and Socket Concrete Class 100D sewers with rubber rings				
		300mm diameter (pipe 11D)	m	41	R	R
		525mm diameter (pipe 6)	m	80	R	R
		600mm diameter (pipes 1 and 14)	m	58	R	R
13.6		MANHOLES				
		Precast 1000mm diameter concrete manhole as per drawing, complete with excavation and backfill, base, channel and concrete lid				
13.6.1		0.0 - 1.0m	No	2	R	R
13.6.2		1.0 - 2.0m	No	1	R	R
13.6.3		6.0 to 7.0m (Subsoil drainage sump)	No	1	R	R
		Precast 1500mm diameter concrete manhole as per drawing, complete with excavation and backfill, base, channel and concrete lid				
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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
		TOTAL CARRIED FORWARD FROM PREVIOUS PAGE				R
13.6.4		1.0 - 2.0m (Scum pump box)	No	1	R	R
13.7		MISCELLANEOUS				
13.7.1		Allow a provisional sum for small items omitted from this section (Implemented per instruction by the Engineer)	Prov. Sum	1	R 100,000.00	R 100,000.00
13		TOTAL SECTION 13 CARRIED FORWARD TO SUMMARY				R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
14		<u>SECTION 14: ROADS AND STORMWATER MANAGEMENT AND MISCELLANEOUS WORK</u>				
14.1		Provisional sum for roads and stormwater to meet WUL conditions as per the instructions of the Client/Engineer	Prov Sum	1	R 6 500,000.00	R 6 500,000.00
14.2		Relocation and/or protection of existing services to allow uninterrupted operation of the plant. (Implemented per instruction by the Engineer)	Prov Sum	1	R 3 000,000.00	R 3 000,000.00
14.3		Reimbursement for any other specialist work required by the Employer/Employer Agent identified during construction.	Prov Sum	1	R 3 000,000.00	R 3 000,000.00
14.4		Provisional sum for the provision of a galvanised steel mobile hoist system (load tested) to safely remove reactor equipment for maintenance.	Prov Sum	1	R 500,000.00	R 500,000.00
14.5		Provisional sum for construction of a constructed wetland as per DWS condition for issuance of a WUL	Prov Sum	1	R 2 500,000.00	R 2 500,000.00
14		TOTAL SECTION 14 CARRIED FORWARD TO SUMMARY				R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
15		<u>SECTION 15: SCREENS, SCREENINGS CONVEYOR AND COMPACTOR</u>	-	-		
15.1		MECHANICAL SCREENS				
		<u>Supply of the following plant, including the storage, quality assurance and painting where applicable</u>	-			
15.1.1		Front rake screen with drive mechanism	No	2	R	R
15.1.2		Discharge chute/conveyor	No	1	R	R
15.1.3		Screenings washer/ compactor	No	1	R	R
15.2		HAND RAKED SCREENS				
		<u>Supply of the following plant, including the storage, quality assurance and painting where applicable</u>	-			
15.2.1		Hand raked coarse screen	No	1	R	R
15.2.2		Hand raked fine screen in overflow channel	No	1	R	R
15.3		INSTALLATION AND COMMISSIONING				
15.3.1		Erection & installation of plant & materials supplied under items 15.1 and 15.2	Sum	1	R	R
15.3.2		Commissioning of plant & equipment supplied under items 15.1 and 15.2	Sum	1	R	R
15.3.2		Allow for the cost of returning to site if necessary and if ordered, in order to carry out tests on the plant.	Sum	1	R	R
		Period for complete delivery of all plant and material from date of order.....weeks				
15		TOTAL SECTION 15 CARRIED FORWARD TO SUMMARY				R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
16		<u>SECTION 16: MECHANICAL GRIT REMOVAL</u>				
16.1		<u>MECHANICAL GRIT REMOVAL</u>	-			
		<u>Supply of the following plant, including the storage, quality assurance and painting where applicable</u>	-			
16.1.1		Grit Classifier	No	1	R	R
16.1.2		Grit removal Pumps, complete with pipework	No	2	R	R
16.2		<u>INSTALLATION AND COMMISSIONING</u>				
16.2.1		Erection & installation of plant & materials supplied under items 16.1	Sum	1	R	R
16.2.2		Commissioning of plant & equipment supplied under items 16.1	Sum	1	R	R
16.2.3		Allow for the cost of returning to site if necessary and if ordered, in order to carry out tests on the plant.	Sum	1	R	R
		Period for complete delivery of all plant and material from date of order.....weeks				
		Period in which complete erection will be affected and plant handed over to the satisfaction of the Engineer, from the date of delivery or receipt of order with erection, whichever is later.....weeks				
16		TOTAL SECTION 16 CARRIED FORWARD TO SUMMARY				R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
17		SECTION 17: MIXERS (STIRRERS)				
17.1		MIXERS	-			
		<u>Supply of the following plant, including the storage, quality assurance and painting where applicable</u>	-			
		Vertical shaft mixers on platforms:	-			
17.1.1		Anaerobic Basin	No	2	R	R
17.1.2		Anoxic Basin	No	2	R	R
17.2		INSTALLATION AND COMMISSIONING				
17.2.1		Produce mechanical drawings for all plant supplied under items 19.1.1 to 19.1.2	Sum	1	R	R
17.2.2		Erection & installation of plant & materials supplied under items 19.1.1 to 19.1.2	Sum	1	R	R
17.2.3		Commissioning of plant & equipment supplied under items 19.1.1 to 19.1.2	Sum	1	R	R
17.2.4		Allow for the cost of returning to site if necessary and if ordered, in order to carry out tests on the plant.	Sum	1	R	R
		Period for complete delivery of all plant and material from date of order.....weeks				
		Period in which complete erection will be affected and plant handed over to the satisfaction of the Engineer, from the date of delivery or receipt of order with erection, whichever is later.....weeks				
17		TOTAL SECTION 17 CARRIED FORWARD TO SUMMARY				R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
18	PSB2.6	SECTION 18: SURFACE AERATORS <u>Supply of the following plant, including the storage, quality assurance and painting where applicable</u>	-			
18.1	PSB2.6	AERATORS Vertical slow speed aerators complete with motors and gearboxes, couplings, base plates, splash guards and draft tubes, all corrosion protected as specified				
18.1.1		Aerators: 55kW each.	No	5	R	R
18.2		INSTALLATION AND COMMISSIONING				
18.2.1		Design and produce mechanical drawings for all plant supplied under items 20.1.1	Sum	1	R	R
18.2.2		Erection & installation of plant & materials supplied under items 20.1.1	Sum	1	R	R
18.2.3		Commissioning of plant & equipment supplied under items 20.1.1				
18.2.4		Allow for the cost of returning to site if necessary and if ordered, in order to carry out tests on the plant.	Sum	1	R	R
		Period for complete delivery of all plant and material from date of order.....weeks				
		Period in which complete erection will be affected and plant handed over to the satisfaction of the Engineer, from the date of delivery or receipt of order with erection, whichever is later.....weeks				
18		TOTAL SECTION 18 CARRIED FORWARD TO SUMMARY				R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
19		SECTION 19: CLARIFIERS				
		<u>Supply of the following plant, including the storage, quality assurance and painting where applicable</u>	-			
19.1		CLARIFIER EQUIPMENT				
19.1.1		Rotating bridge, handrailings, sludge scraper equipment mounted to bridge, scum removal equipment, corrosion protection, driving motor and electrical connections as specified.	No	2	R	R
19.1.2		Weir plate each 82m long	No	2	R	R
19.1.3		Stilling chambers	No	2	R	R
19.2		INSTALLATION AND COMMISSIONING				
19.2.1		Design and produce mechanical drawings for all plant supplied under items 19.1	Sum	1	R	R
19.2.2		Erection & installation of plant & materials supplied under items 19.1	Sum	1	R	R
19.2.3		Commissioning of plant & equipment supplied under items 19.1	Sum	1	R	R
19.2.4		Allow for the cost of returning to site if necessary and if ordered, in order to carry out tests on the plant.	Sum	1	R	R
		Period for complete delivery of all plant and material from date of order.....weeks				
		Period in which complete erection will be affected and plant handed over to the satisfaction of the Engineer, from the date of delivery or receipt of order with erection, whichever is later.....weeks				
19		TOTAL SECTION 19 CARRIED FORWARD TO SUMMARY				R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
20		<u>SECTION 20: PUMPS AND ASSOCIATED PIPEWORK</u>				
		<u>Supply of the following pumps (belt driven) and motors with pump stand, mounting plates and bolts as specified, including the storage, quality assurance and painting where applicable</u>	-			
20.1		WAS PUMPS				
20.1.1		Pump Gorman Rupp or Cornell or similar approved,	No	2	R	R
20.2		DEWATERING AND SCUM REMOVAL PUMPS				
		<u>Supply and installation of the following submersible pumps and motors</u>				
20.2.1		Grundfos SV014BL (S-Peller) or similar approved,	No	2	R	R
		50mm Diameter flexible hose with quick release couplings:				
20.2.2		6m long	No	1	R	R
20.2.3		1,5m long	No	1	R	R
20.3		DESIGN STEEL PIPE WORK AND SPECIALS				
		Design and produce mechanical drawings for all pump sets with steel pipework as required.				
20.3.1		WAS pumps	Sum	1	R	R
20.3.2		Submersible pumps	Sum	1	R	R
20.4		INSTALLATION AND COMMISSIONING	Sum	1	R	R
20.4.1		Erection & installation of plant & materials supplied under items 20.2 and 20.3	Sum	1	R	R
20.4.2		Commissioning of plant & equipment supplied under items 20.2 and 20.3				
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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
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20.4.3		Allow for the cost of returning to site if necessary and if ordered, in order to carry out tests on the plant. Period for complete delivery of all plant and material from date of order.....weeks	Sum	1	R	R
20	TOTAL SECTION 20 CARRIED FORWARD TO SUMMARY					R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
21		SECTION 21: AXIAL FLOW MIXED LIQUOR RECYCLE PUMPS				
		Supply of the following plant, including the storage, quality assurance and painting where applicable				
21.1		MIXED LIQUOR RECYCLE PUMPS				
		Belt driven axial flow mixed liquor recycle pumps, complete with motors, mounting plates and bolts and any other required equipment, all corrosion protected as specified				
21.1.1		RAS Pumps	No	3	R	R
21.1.2		a - Recycle pumps	No	3	R	R
21.2		INSTALLATION AND COMMISSIONING				
21.2.1		Design and produce mechanical drawings for all plant supplied under items 21.1	Sum	1	R	R
21.2.2		Erection & installation of plant & materials supplied under item 21.1	Sum	1	R	R
21.2.3		Commissioning of plant & equipment supplied under item 21.1	Sum	1	R	R
21.2.4		Allow for the cost of returning to site if necessary and if ordered, in order to carry out tests on the plant.	Sum	1	R	R
		Period for complete delivery of all plant and material from date of order.....weeks				
		Period in which complete erection will be affected and plant handed over to the satisfaction of the Engineer, from the date of delivery or receipt of order with erection, whichever is later.....weeks				
21		TOTAL SECTION 21 CARRIED FORWARD TO SUMMARY				R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
22		SECTION 22: WEIRS AND SLUICE GATES				
		Supply of the following plant, including the storage, quality assurance and painting where applicable				
22.1		PENSTOCKS AT INLET WORKS				
22.1.1		No A: Rising channel gate	No	4	R	R
22.2		PENSTOCKS AT FLOW DIVISION BOX				
22.2.1		No B: Wall mounted rising sluice gate with extended spindles and flush invert	No	2	R	R
22.3		PENSTOCKS AT BIOLOGICAL REACTOR OUTLET				
22.3.1		No C: Wall mounted rising sluice gate with extended spindles and flush invert	No	2	R	R
22.4		WEIRS IN STAINLESS STEEL				
		Flow Division Box at Inlet Works				
22.4.1	PSB2.9.1	4m Long rectangular as specified	No	2	R	R
22.4.2	PSB2.9.1	2m Long rectangular as specified	No	1	R	R
		Biological Reactor				
22.4.3	PSB2.9.1	10m Long rectangular as specified	No	1	R	R
22.4.4		3m Long rectangular as specified	No	1	R	R
		Chlorine Contact Channels				
22.4.6	PSB2.9.1	1.5m Long rectangular as specified	No	1	R	R
22.5		INSTALLATION AND COMMISSIONING				
22	TOTAL CARRIED FORWARD TO NEXT PAGE					R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
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22.5.1		Design and produce mechanical drawings for all plant supplied under items 22,1 to 22,4	Sum	1	R	R
22.5.2		Erection & installation of plant & materials supplied under items 22,1 to 22,4	Sum	1	R	R
22.5.3		Commissioning of plant & equipment supplied under items 22,1 to 22,4	Sum	1	R	R
		Period for complete delivery of all plant and material from date of order.....weeks				
		Period in which complete erection will be affected and plant handed over to the satisfaction of the Engineer, from the date of delivery or receipt of order with erection, whichever is later.....weeks				
22	TOTAL SECTION 22 CARRIED FORWARD TO SUMMARY					R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
23		SECTION 23: LIME DOSAGE AND STORAGE EQUIPMENT				
		Supply of the following material, including the storage, quality assurance and painting where applicable				
23.1		MIXING EQUIPMENT				
23.1.1		Mixer with motor	Sum	1	R	R
23.2		DOSING EQUIPMENT				
23.1.2		Lime dosing equipment complete as offered in data sheets	Sum	1	R	R
23.3		DESIGN OF LAYOUT				
23.1.1		Design of layout of equipment and pipework under item 23.1 and 23.2	Sum	1	R	R
23.4		INSTALLATION AND COMMISSIONING				
23.4.1		Installation of plant and materials supplied under items 23.1 and 23.2	Sum	1	R	R
23.4.2		Commissioning of materials and equipment supplied under items 23.1 and 23.2	Sum	1	R	R
		Period for complete delivery of all plant and material from date of order.....weeks				
		Period in which complete erection will be affected and plant handed over to the satisfaction of the Engineer, from the date of delivery or receipt of order with erection, whichever is later.....weeks				
23		TOTAL SECTION 23 CARRIED FORWARD TO SUMMARY				R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
24	PSB2.12	SECTION 24: CHLORINATION EQUIPMENT				
24.1		Chlorination dosing equipment as specified, complete with standby chlorinator, installed and 4-20mA signal connection to effluent flow meter	Sum	1	R	R
24.2		Balance scale for 70kg cylinder	No	1	R	R
24.3		Gas Leak detector	Sum	1	R	R
24.4		Vent van system	Sum	1	R	R
24.5		Supply and install safety equipment as specified:				
24.5.1		Spanners to allow cylinder changes	Set	1	R	R
24.5.2		Full gas mask (canister type)	No	2	R	R
24.5.3		Canister for gas mask (chlorine gas use)	No	4	R	R
24.5.4		Chemical glove sets	No	2	R	R
24.5.5		Set of safety signs (in English)	No	2	R	R
24.5.6		Gas mask box with breakable glass and key	No	1	R	R
24.5.7		Test ammonia kit	No	1	R	R
		Period for complete delivery of all plant and material from date of order.....weeks				
		Period in which complete erection will be affected and plant handed over to the satisfaction of the Engineer, from the date of delivery or receipt of order with erection, whichever is later.....weeks				
24	TOTAL SECTION 24 CARRIED FORWARD TO SUMMARY					R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
25		SECTION 25: FLOW MEASUREMENT AND PARSHALL FLUME				
		Supply of the following plant, including the storage, quality assurance and painting where applicable				
25.1		ULTRASONIC FLOW METER IN CHANNELS/BOXES WITH DATA LOGGER				
25.1.1	PSB2.4.2.1	At Inlet Works	No	1	R	R
25.2		PIPE FLOW MEASUREMENT				
		Enclosed pipe magnetic flow meter to fit onto :				
25.2.1	PSB2.4.2.2	RAS lines	No	2	R	R
25.2.2		WAS line	No	1	R	R
25.3		FLOW CONTROL				
25.3.1	PSB2.4.1	Parshall Flume with a throat width of 305mm	No	1	R	R
25.4		INSTALLATION AND COMMISSIONING				
25.4.1		Erection & installation of plant & materials supplied under items 25.1 to 25.3	Sum	1	R	R
25.4.2		Commissioning of plant & equipment supplied under items 25.1 to 25.3	Sum	1	R	R
25.4.3		Allow for the cost of returning to site if necessary and if ordered, in order to carry out tests on the plant.	Sum	1	R	R
		Period for complete delivery of all plant and material from date of order.....weeks				
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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
TOTAL CARRIED FORWARD FROM PREVIOUS PAGE						R
		Period in which complete erection will be affected and plant handed over to the satisfaction of the Engineer, from the date of delivery or receipt of order with erection, whichever is later.....weeks				
25	TOTAL SECTION 25 CARRIED FORWARD TO SUMMARY					R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
26	PSB2.13	SECTION 26: MISCELLANEOUS Supply and installation of the following plant, including the storage, quality assurance and painting where applicable	-			
26.1		SKIPS				
26.1.1	PSB2.13.1	Skips 6m³ each	No	3	R	R
26.1.2	PSB2.13.1	Trailer with hoist equipment for 6m³ skips	No	1	R	R
26.2		GRP GRATINGS AND SUPPORT				
26.2.1	PSB2.13.4	GRP Grating with SS supports as specified	m²	12	R	R
26.2		Allow a provisional sum for small items omitted from this section Period for complete delivery of all plant and material from date of order.....weeks Period in which complete erection will be affected and plant handed over to the satisfaction of the Engineer, from the date of delivery or receipt of order with erection, whichever is later.....weeks	Prov. Sum	1	R 300,000.00	R 300,000.00
26	TOTAL SECTION CARRIED FORWARD TO SUMMARY					R

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Item No	Payment Ref	Description	Unit	Qty	Rate R c	Amount R c
		SECTION: E1 BULK SUPPLY				
		Allow for all the costs and expenses in connection with the following:				
		General				
E1.1		Liaison with Supply Authority for switching and electrical integration	Sum	1	R	R
		All cost for Eskom application for supply upgrade (upgrade MV equipment from 315kVa to 1000kVa)	Sum	1	R	R
E1.2		Liaison with Local Authorities for wayleave applications	Sum	1	R	R
E1.3		Liaison with Civil Contractor for route planning on site	Sum	1	R	R
E1.4		Decommissioning and removal off site of existing MV equipment	Sum	1	R	R
		Excavations, etc.				
		Excavate and set excavated material aside for re-use as filling for cable or sleeve trench not exceeding 1m deep				
E1.5		In earth	m³	50	R	R
E1.6		In soft rock	m³	50	R	R
E1.7		In rock	m³	50	R	R
E1.8		Selected and approved material for backfilling, bedding and cover	m³	100	R	R
E1.9		Surplus excavated material spread and levelled on site as directed	m³	50	R	R
E1.10		Danger tape - 400mm wide overlapping	m	300	R	R
E1.11		Cable marker, with engraved aluminum plate	No	25	R	R
TOTAL CARRIED FORWARD TO NEXT PAGE						R

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Item No	Payment Ref	Description	Unit	Qty	Rate	Amount
		TOTAL CARRIED FROM PREVIOUS PAGE				R
E1.12		110 mmΦ sleeve (internal diameter)	m	20	R	R
E1.13		160 mmΦ sleeves (internal diameter)	m	20	R	R
E1.14		Testing and Commissioning	Sum	1	R	R
		All other items not included above, but which are nevertheless necessary to meet the Specification and/or required for the proper, safe and effective operation of the plant (Specify)	-			
E1		TOTAL SECTION: E1 CARRIED TO SUMMARY				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		SECTION: E2 Back-up Generator - Allow for all the costs and expenses in connection with the design, manufacture, routine testing, factory acceptance testing (if indicated), supply, delivery, offloading and storage of the following materials and equipment: - Diesel Generator Outdoor Set	-			
E2.1		Canopy or containerized Diesel generator and base mounted diesel tank	No	1	R	R
E2.2		Modified Exhaust System for generator	No	1	R	R
E2.3		Electrical fuel transfer pump (with fuel sensor)	Sum	1	R	R
E2.4		Control panel complete with controller	Sum	1	R	R
E2.5		Control cabling and incorporation of controller to fibre optic network and PLC	Sum	1	R	R
E2.6		Service and Maintenance Contract	Month	12	R	R
		Fuel				
E2.7		Free standing diesel storage tank	Sum	1	R	R
E2.8		Fuel (enough for testing and commissioning and a full tank with handover)	litre	2,000	R	R
E2.9		Earthing and bonding of the installation	Sum	1	R	R
		Allow for all the costs and expenses in connection with the delivery, offloading and storage of the following:				
TOTAL CARRIED TO NEXT PAGE						R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
TOTAL CARRIED FROM PREVIOUS PAGE						R
E2.10		All materials and equipment summarized in Section E2 complete Sum - Other: - All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant (Specify):- 		1	R	R
E2	TOTAL SECTION: E2 CARRIED TO SUMMARY					R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		SECTION: E3				
		LV SWITCHGEAR AND CONTROL ASSEMBLIES				
		-	-			
		Switchgear Assemblies	-			
		-	-			
		New MAIN Motor Control Centre - MCC-MAIN complete. Factory acceptance testing for two persons included.	-			
E3.1		Supply	Sum	1	R	R
E3.2		Install	Sum	1	R	R
E3.3		Testing and Commissioning	Sum	1	R	R
		-	-			
		Chlorine Dosing Control Panel LCP-CL complete. Factory acceptance testing for two persons included.	-			
E3.4		Supply	Sum	1	R	R
E3.5		Install	Sum	1	R	R
E3.6		Testing and Commissioning	Sum	1	R	R
		-	-			
		Motor Field Control Stations	-			
E3.7		Supply	No	40	R	R
E3.8		Install	No	40	R	R
E3.9		Testing and Commissioning	No	40	R	R
E3.10		Allow for all costs and expenses in connection with the Site Delivery of items in this section	Sum	1	R	R
TOTAL CARRIED TO NEXT PAGE						R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
	TOTAL CARRIED FROM PREVIOUS PAGE					R
E3.11		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant (Specify):- 	Sum	1	R	R
E3	TOTAL SECTION: E3 CARRIED TO SUMMARY					R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		SECTION: E4 LV CABLES Allow for all the costs and expenses in connection with the design, manufacture, routine testing, factory acceptance testing (if indicated), supply, delivery, offloading and storage of the following materials and equipment and installation: SUPPLY and INSTALLATION Cu/PVC Insulated/PVC Bedded/SWA/PVC Sheathed 600/1000V multicore cable with stranded conductors.	-			
E4.1		2.5mm ² x 4 core	m	700	R	R
E4.2		4.0mm ² x 4 core	m	350	R	R
E4.3		6mm ² x 4 core	m	200	R	R
E4.4		10mm ² x 4 core	m	200	R	R
E4.5		16mm ² x 4 core	m	100	R	R
E4.6		25mm ² x 4 core	m	100	R	R
E4.7		35mm ² x 4 core	m	100	R	R
E4.8		50mm ² x 4 core	m	-	R	Rate Only
E4.9		70mm ² x 4 core	m	-	R	Rate Only
E4.10		95mm ² x 4 core	m	100	R	R
E4.11		120mm ² x 4 core	m	100	R	R
TOTAL CARRIED TO NEXT PAGE						R

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Item No	Payment Clause	Description	Unit	Qty	Rate R/c	Amount R/c
TOTAL CARRIED FROM PREVIOUS PAGE						R
E4.12		150mm ² x 4 core	m	100	R	Rate Only
E4.13		185mm ² x 4 core	m	-	R	Rate Only
E4.14		240mm ² x 4 core	m	1000	R	R
E4.15		300mm ² x 4 core	m	-	R	Rate Only
E4.16		400mm ² x 4 core	m	-	R	Rate Only
		Cable terminations for Cu/PVC Insulated/PVC Bedded/SWA/PVC Sheathed 600/1000V multicore cables, complete, including gland shroud, lugs, number tags, etc and connection.				
E4.17		2.5mm ² x 4 core	No	30	R	R
E4.18		4.0mm ² x 4 core	No	10	R	R
E4.19		6mm ² x 4 core	No	10	R	R
E4.20		10mm ² x 4 core	No	10	R	R
E4.21		16mm ² x 4 core	No	10	R	R
E4.22		25mm ² x 4 core	No	10	R	R
E4.23		35mm ² x 4 core	No	10	R	R
E4.24		50mm ² x 4 core	No	-	R	Rate Only
E4.25		70mm ² x 4 core	No	-	R	Rate Only
TOTAL SECTION: CARRIED TO NEXT PAGE						R

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Item No	Payme nt Clause	Description	Unit	Qty	Rate R c	Amount R c
		TOTAL CARRIED FROM PREVIOUS PAGE				R
E4.25		95mm ² x 4 core	No	100	R	R
E4.26		120mm ² x 4 core	No	10	R	R
E4.27		150mm ² x 4 core	No	-	R	Rate Only
E4.28		185mm ² x 4 core	No	-	R	Rate Only
E4.29		240mm ² x 4 core	No	10	R	R
E4.30		300mm ² x 4 core	No	-	R	Rate Only
E4.31		400mm ² x 4 core	No	-	R	Rate Only
		Cu/PVC Insulated/PVC Bedded/AWA/PVC Sheathed 600/1000V single core cable with stranded conductors. Cable fixed to cable tray, drawn into sleeves or laid into trenches.				
E4.31		150mm ² x 1 core	m	-	R	Rate Only
E4.32		185mm ² x 1 core	m	-	R	Rate Only
E4.33		240mm ² x 1 core	m	-	R	Rate Only
E4.34		300mm ² x 1 core	m	-	R	Rate Only
E4.35		400mm ² x 1 core	m	-	R	Rate Only
E4.36		500mm ² x 1 core	m	-	R	Rate Only
		Cable terminations for Cu/PVC Insulated/PVC Bedded/AWA/PVC Sheathed 600/1000V single core cables, complete, including gland shroud, lugs, number tags, etc and connection.				
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payme nt Clause	Description	Unit	Qty	Rate R c	Amount R c
		TOTAL SECTION: CARRIED FROM PREVIOUS PAGE				R
E4.37		150mm ² x 1 core	No	-	R	Rate Only
E4.38		185mm ² x 1 core	No	-	R	Rate Only
E4.39		240mm ² x 1 core	No	-	R	Rate Only
E4.40		300mm ² x 1 core	No	-	R	Rate Only
E4.41		400mm ² x 1 core	No	-	R	Rate Only
E4.42		500mm ² x 1 core	No	-	R	Rate Only
		Bare Copper Earth cable with stranded conductors.				
E4.43		2.5mm ²	m	500	R	R
E4.44		4mm ²	m	500	R	R
E4.45		6mm ²	m	100	R	R
E4.46		10mm ²	m	100	R	R
E4.47		16mm ²	m	100	R	R
E4.48		25mm ²	m	100	R	R
E4.49		35mm ²	m	-	R	Rate Only
E4.50		50mm ²	m	-	R	Rate Only
E4.51		70mm ²	m	-	R	Rate Only
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
TOTAL SECTION CARRIED FROM PREVIOUS PAGE						R
E4.52		95mm ²	m	100	R	R
E4.53		120mm ²	m	1000	R	R
E4.54		150mm ²	m	-	R	Rate Only
E4.55		240mm ²	m	-	R	Rate Only
E4.56		Cable terminations for bare copper earth cables, complete, including gland shroud, lugs, number tags, etc and connection. 2.5mm ²	No	20	R	R
E4.57		4mm ²	No	20	R	R
E4.58		6mm ²	No	20	R	R
E4.59		10mm ²	No	20	R	R
E4.60		16mm ²	No	20	R	R
E4.62		25mm ²	No	20 100	R R	R R
E4.63		35mm ²	No	-	R	Rate Only
E4.64		50mm ²	No	-	R	Rate Only
E4.65		70mm ²	No	-	R	Rate Only
E4.66		95mm ²	No	10	R	R
E4.67		120mm ²	No	10	R	R
E4.68		150mm ²	No	-	R	Rate Only
E4.69		240mm ²	No	-	R	Rate Only
EARTHWORKS (CABLE AND DUCT TRENCHES)						
TOTAL SECTION: CARRIED TO NEXT PAGE						R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		TOTAL SECTION CARRIED FROM PREVIOUS PAGE				R
E4.70		Excavate and set excavated material aside for re-use as filling for cable or sleeve trench not exceeding 1m deep In earth	m³	400	R	R
E4.71		In soft rock	m³	150	R	R
E4.72		In rock	m³	50	R	R
E4.73		Bedding material imported from off-site source (provisional)	m³	300	R	R
E4.74		Danger tape - 400mm wide overlapping	m	1000	R	R
E4.75		Cable marker with engraved steel plate	No	20	R	R
E4.76		Allow for all costs and expenses in connection with the Site Delivery of items in this section	Sum	1	R	R
		All other items not included above, but which are nevertheless necessary to meet the Specification and/or required for the proper, safe and effective operation of the plant (Specify)	-			
E4		TOTAL SECTION: E4 CARRIED TO SUMMARY				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		SECTION: E5 CABLE SUPPORTS Allow for all costs and expenses in connection with design, manufacture, routine testing, factory acceptance testing (if indicated), supply, delivery, offloading and storage of the following materials and equipment and installation: SUPPLY AND INSTALLATION Cable Ladder - Stainless steel welded cable ladder, 3mm thick side rails, channel cross rungs at 300mm centres, complete with couplers, clamps, threaded rods, hangers, cantilevers, brackets etc. to fix to trusses, walls. 100 x 100mm (W x H) E5.1 Straight length m 100 R R E5.2 Bends for cable ladder above No 10 R R 200 x 100mm (W x H) E5.3 Straight length m 100 R R E5.4 Bends for cable ladder above No 10 R R 300 x 100mm (W x H) E5.5 Straight length m 100 R R E5.6 Bends for cable ladder above No 10 R R 600 x 100mm (W x H) E5.7 Straight length m 100 R R	- - -			
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		TOTAL SECTION CARRIED FROM PREVIOUS PAGE				R
E5.8		Bends for cable ladder above 800 x 100mm (W x H)	No	10	R	R
E5.9		Straight length	m	100	R	R
E5.10		Bends for cable ladder above 1000 x 100mm (W x H)	No	10	R	R
E5.11		Straight length	m	50	R	R
E5.12		Bends for cable ladder above Wire Mesh Tray - Stainless steel welded Wire Mesh Cable Tray, 50 x 50mm Base Aperture, 25 x 50mm Side Aperture, complete with splices, couplers, clamps, threaded rods, hangers, brackets etc to fix to trusses, walls etc 100 x 50mm (W x H), Ø 4mm Wire	No	3	R	R
E5.13		Straight length 200 x 50mm (W x H), Ø 4mm Wire	m	100	R	R
E5.14		Straight length	m	100	R	R
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		CARRIED FROM PREVIOUS PAGE				R
E5.15		300 x 50mm (W x H), Ø 4mm Wire Straight length	m	100	R	R
E5.16		400 x 50mm (W x H), Ø 4mm Wire Straight length	m	100	R	R
E5.17		Supply hot dipped galvanized steel conduit 20 Ø mm	m	200	R	R
E5.18		25 Ø mm All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant (Specify):-	m	200	R	R
E5		TOTAL SECTION: E5 CARRIED TO SUMMARY				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		SECTION: E6 BUILDING ELECTRICAL	-			
		-	-			
		Allow for all the costs and expenses in connection with the design, manufacture, routine testing, factory acceptance testing (if indicated), supply, delivery, offloading and storage of the following materials and equipment:	-			
		-	-			
		Power Distribution Panels				
		Distribution Board				
E6.1		Supply	No	3	R	R
E6.2		Installation	No	3	R	R
E6.3		Testing and Commissioning	No	3	R	R
		Area lighting Kiosk				
E6.4		Supply	No	1	R	R
E6.5		Installation	No	1	R	R
E6.6		Testing and Commissioning	No	1	R	R
		Lighting				
		Photometric Cell				
E6.7		Supply	No	4	R	R
E6.8		Installation	No	4	R	R
		Type B: LED Tube vapour proof Fitting,				
E6.9		Supply	No	25	R	R
E6.10		Installation	No	25	R	R
		Type B: LED Tube vapour proof Fitting, (Emergency)				
E6.11		Supply	No	12	R	R
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
CARRIED FROM PREVIOUS PAGE						R
E6.12		Installation Type C: LED outdoor bulkhead	No	12	R	R
E6.13		Supply	No	6	R	R
E6.14		Installation Type SL: 55W LED pole mounted streetlight	No	6	R	R
E6.15		Supply	No	10	R	R
E6.16		Installation 7m high GRP Poles	No	10	R	R
E6.17		Supply	No	10	R	R
E6.18		Installation Light Switches 1 lever 1 way, 20A, flush mounted switch	No	10	R	R
E6.19		Supply	No	10	R	R
E6.20		Installation	No	10	R	R
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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
CARRIED FROM PREVIOUS PAGE						R
E6.21		1 lever 2 way, 20A, flush mounted switch Supply	No	6	R	R
E6.22		Installation	No	6	R	R
Wall power outlets and switch disconnectors						
Double pole 20A Switch Disconnectors						
E6.23		Supply	No	6	R	R
E6.24		Installation	No	6	R	R
3-pin 250V double switched socket outlet						
E6.25		Supply	No	15	R	R
E6.26		Installation	No	15	R	R
5-pin 400V socket outlet						
E6.27		Supply	No	5	R	R
E6.28		Installation	No	5	R	R
Power Trunking						
P1000 power trunking						
E6.29		Supply	m	30	R	R
E6.30		Installation	m	30	R	R
Wireways						
Double compartment power skirting - outside dimensions 55 x 160mm minimum complete with elbows, tees and end caps.						
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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
CARRIED FROM PREVIOUS PAGE						R
E6.31		Supply	m	30	R	R
E6.32		Install	m	30	R	R
		Supply PVC Conduit cast into concrete or built/chased into brickwork or concrete. Complete with bends, couplings, glue, PVC Round conduit boxes placed in position etc.				
E6.33		20mm Diameter	m	100	R	R
E6.34		25mm Diameter	m	100	R	R
E6.35		32mm Diameter	m	100	R	R
		Install PVC Conduit cast into concrete or built/chased into brickwork or concrete. Complete with bends, couplings, glue, PVC Round conduit boxes placed in position etc.				
E6.36		20mm Diameter	m	100	R	R
E6.37		25mm Diameter	m	100	R	R
E6.38		32mm Diameter	m	100	R	R
		Wiring				
		Supply Single core PVC insulated house wire				
E6.39		1.5mm ²	m	100	R	R
E6.40		2.5mm ²	m	250	R	R
E6.41		4mm ²	m	150	R	R
E6.42		6mm ²	m	150	R	R
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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		CARRIED FROM PREVIOUS PAGE				R
E6.43		Install Single core PVC insulated house wire 1.5mm ²	m	100	R	R
E6.44		2.5mm ²	m	250	R	R
E6.45		4mm ²	m	150	R	R
E6.46		6mm ²	m	150	R	R
E6.47		Supply Single core PVC insulated earth wire 1.5mm ²	m	50	R	R
E6.48		2.5mm ²	m	200	R	R
E6.49		4mm ²	m	100	R	R
E6.50		6mm ²	m	50	R	R
E6.51		Install Single core PVC insulated earth wire 1.5mm ²	m	50	R	R
E6.52		2.5mm ²	m	200	R	R
E6.53		4mm ²	m	100	R	R
E6.54		6mm ²	m	50	R	R
E6.55		Supply Twin and Earth PVC insulated wire 2.5mm ²	m	100	R	R
E6.56		4mm ²	m	-	R	Rate only
E6.57		6mm ²	m	-	R	Rate only
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		CARRIED FROM PREVIOUS PAGE				R
E6.58		Install Twin and Earth PVC insulated wire 2.5mm ²	m	100	R	R
E6.59		4mm ²	m	-	R	Rate only
E6.60		6mm ²	m	-	R	Rate only
		Earthing and Bonding of Electrical System (Refer to Lightning Protection and Earthing bill for additional Earthing and building LPS system)				
E6.61		Ensure earthing & bonding of entire electrical system to main building earth (including all cable racking)	Sum	1	R	R
E6.62		Labeling of Conductors and Equipment	Sum	1	R	R
		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant (Specify):- 				
E6		TOTAL SECTION: E6 CARRIED TO SUMMARY				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		SECTION: I1 INSTRUMENTATION, CONTROL AND DATA CABLES Allow for all the costs and expenses in connection with the design, manufacture, routine testing, factory acceptance testing (if indicated), supply, delivery, offloading and storage of the following materials and equipment: SUPPLY AND INSTALLATION Cu/PVC Insulated/PVC Bedded/SWA/PVC Sheathed 600/1000V multicore control cables with stranded conductors. Cable fixed to cable tray, drawn into sleeves or laid into trenches.				
I1.1		2.5mm ² x 4 core	m	500	R	R
I1.2		2.5mm ² x 7 core	m	500	R	R
I1.3		1.5mm ² x 12 core	m	-	R	Rate Only
I1.4		1.5mm ² x 19 core	m	-	R	Rate Only
I1.5		1.5mm ² x 24 core	m	-	R	Rate Only
I1.6		1.5mm ² x 30 core	m	-	R	Rate Only
I1.7		1.5mm ² x 37 core	m	-	R	Rate Only
I1.8		CAT6 Cable	m	500	R	R
I1.9		Armoured Multimode Fibre optic Cable (6C)	m	-		Rate Only
I1.10		Fieldbus Cables	m	-		Rate Only
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		TOTAL SECTION: CARRIED TO NEXT PAGE				R
		Cable terminations for multicore control cable complete, including gland shroud, lugs, number tags, etc and connection.				
I1.11		2.5mm ² x 4 core	No	20	R	R
I1.12		2.5mm ² x 7 core	No	20	R	R
I1.13		1.5mm ² x 12 core	No	-	R	Rate Only
I1.14		1.5mm ² x 19 core	No	-	R	Rate Only
I1.15		1.5mm ² x 24 core	No	-	R	Rate Only
I1.16		1.5mm ² x 30 core	No	-	R	Rate Only
I1.17		1.5mm ² x 37 core	No	-	R	Rate Only
I1.18		CAT6 Cable	No	10	R	R
I1.19		Armoured Multimode Fibre optic Cable (6C)	No	-	R	Rate Only
I1.20		Fieldbus Cables	No	-	R	Rate Only
		Extra low voltage instrumentation cable fixed to cable tray, drawn into sleeves or power skirting.				
I1.21		1.5mm ² 1-pair	m	250	R	R
I1.22		1.5mm ² 2-pair	m	250	R	R
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		CARRIED FROM PREVIOUS PAGE				R
I1.23		1.5mm ² 4-pair	m	-	R	Rate Only
I1.24		1.5mm ² 12-pair	m	-	R	Rate Only
I1.25		1.5mm ² 19-pair	m	-	R	Rate Only
I1.26		1.5mm ² 30-pair	m	-	R	Rate Only
I1.27		1.5mm ² 1-triad	m	-	R	Rate Only
I1.28		1.5mm ² 2-triad	m	-	R	Rate Only
		Terminations for Extra low voltage instrumentation cable				
I1.29		1.5mm ² 1-pair	No	20	R	R
I1.30		1.5mm ² 2-pair	No	20	R	R
I1.31		1.5mm ² 4-pair	No	-	R	Rate Only
I1.32		1.5mm ² 12-pair	No	-	R	Rate Only
I1.33		1.5mm ² 19-pair	No	-	R	Rate Only
I1.34		1.5mm ² 30-pair	No	-	R	Rate Only
I1.35		1.5mm ² 1-triad	No	-	R	Rate Only
I1.36		1.5mm ² 2-triad	No	-	R	Rate Only
		Instrumentation Power cable Cu/PVC Insulated/PVC Bedded/SWA/PVC Sheathed 600/1000V multicore with stranded conductors. Cable fixed to cable tray, drawn into sleeves or laid into trenches.				
I1.37		2.5mm ² x 3 core	m	500	R	R
I1.38		2.5mm ² x 4 core	m	-	R	Rate Only
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		CARRIED FROM PREVIOUS PAGE				R
I1.39		Terminations for Instrumentation Power cable Cu/PVC Insulated/PVC Bedded/SWA/PVC Sheathed 600/1000V multicore with stranded conductors. 2.5mm ² x 3 core	No	20	R	R
I1.40		2.5mm ² x 4 core	No	-	R	Rate Only
I1.41		Allow for all costs and expenses in connection with the Site Delivery of items in this section All other items not included above, but which are nevertheless necessary to meet the Specification and/or required for the proper, safe and effective operation of the plant (Specify) 	Sum	1	R	R
I1		TOTAL SECTION: I1 CARRIED TO SUMMARY				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		SECTION: I2				
		PROGRAMMABLE LOGIC CONTROLLERS	-			
			-			
		MAIN Programmable Logic Controller - PLC-IW complete with hardware, software and programming. Factory acceptance testing for two persons included				
			-			
		PLC Panel	-			
			-			
I2.1		Supply	Sum	1	R	R
I2.2		Install	Sum	1	R	R
		PLC hardware complete				
I2.3		Supply	Sum	1	R	R
I2.4		Install	Sum	1	R	R
I2.5		Supply and Install PLC Software Complete	Sum	1	R	R
I2.6		Programming of PLC	Sum	1	R	R
I2.7		Simulation Testing of PLC Programming	Sum	1	R	R
I2.8		Testing and Commissioning	Sum	1	R	R
		UPS for PLC, HMI and other control accessories				
I2.9		Supply	No	1	R	R
I2.10		Install	No	1	R	R
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		TOTAL SECTION: CARRIED FROM THE PREVIOUS PAGE				R
		Human Machine Interface - HMI				
I2.11		Supply	Sum	1	R	R
I2.12		Install	Sum	1	R	R
I2.13		Supply and Install HMI Software Complete	Sum	1	R	R
I2.14		Development of mimics, programming of HMI	Sum	1	R	R
I2.15		Testing and Commissioning	sum	1	R	R
		<u>General</u>				
I2.16		Involvement of PLC OEM for consultation, specification of architecture and commissioning assistance	Sum	1	R	R
I2.17		Allow for all costs and expenses in connection with the Site Delivery of items in this section	Sum	1	R	R
		All other items not included above, but which are nevertheless necessary to meet the Specification and/or required for the proper, safe and effective operation of the plant (<i>Specify</i>)	-			
						
		..				
						
		..				
						
		..				
I2		TOTAL SECTION: I2 CARRIED TO SUMMARY				R

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Contractor

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
I3.1		SECTION: I3 INDUSTRIAL NETWORK Functional Design Specification Compile control system FDS as per specifications. Allow for 5 iterations All other items not included above, but which are nevertheless necessary to meet the Specification and/or required for the proper, safe and effective operation of the plant (<i>Specify</i>) 	Sum	1	R	R
I3		TOTAL SECTION: I3 CARRIED TO SUMMARY				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		SECTION: I4 TELEMETRY Allow for all the costs and expenses in connection with the design, manufacture, with hardware and software. Factory acceptance testing for two persons included Telemetry RTU	-			
I4.1		Supply	Sum	1	R	R
I4.2		Install	Sum	1	R	R
I4.3		Testing and Commissioning	Sum	1	R	R
		Other:-				
I4.4		Programming and configuration of Radio Telemetry INLCUDING link to Municipal Offices (by nominated supplier)	Sum	1	R	R
I4.5		Allow for all the costs and expenses in connection with the delivery, offloading and storage of the following: All other items not included above, but which are nevertheless necessary to meet the Specification and/or required for the proper, safe and effective operation of the plant (<i>Specify</i>) Allow for the cost of returning to site if necessary and if ordered, in order to carry out tests on the plant. Allow a provisional sum for small items omitted from this section	Sum	1	R	R
			Prov. Sum	1	R 20,000.00	R 20,000.00
			Prov. Sum	1	R 20,000.00	R 20,000.00
I4		TOTAL SECTION: I4 CARRIED TO SUMMARY				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		SECTION: I5 SCADA, REMOTE MONITORING AND REPORTING	-			
		Allow for all costs and expenses in connection with the following items:	-			
		New WWTW SCADA Hardware	-			
		SCADA Operator & Engineering all-in- one computer (workstation) complete with all accessories				
I5.1		Supply	No	1	R	R
I5.2		Install	No	1	R	R
		23" LED Backlit LCD Displays				
I5.3		Supply	No	4	R	R
I5.4		Install	No	4	R	R
		50" LED Backlit LCD Display				
I5.5		Supply	No	2	R	R
I5.6		Install	No	2	R	R
		KVM media switch complete with all accessories				
I5.7		Supply	No	1	R	R
I5.8		Install	No	1	R	R
		SCADA Server, rack mounted hot standby configuration complete with all accessories				
I5.9		Supply	No	2	R	R
I5.10		Install	No	2	R	R
		Historin Server				
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		TOTAL SECTION: CARRIED FROM THE PREVIOUS PAGE				R
I5.11		Supply	No	1	R	R
I5.12		Install	No	1	R	R
		Main Supervisory Layer Ethernet Switch complete				
I5.13		Supply	No	1	R	R
I5.14		Install	No	1	R	R
		SCADA Administrative rack-mounted, withdrawable KVM (Keyboard Video Mouse) complete with all accessories				
I5.15		Supply	No	1	R	R
I5.16		Install	No	1	R	R
		42U, 19" rack cabinet for all network and computer equipment				
I5.17		Supply	No	1	R	R
I5.18		Install	No	1	R	R
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		CARRIED FROM PREVIOUS PAGE				R
15.19		SCADA computer UPS Supply	No	1	R	R
15.20		Install	No	1	R	R
15.21		SCADA printer Supply	No	1	R	R
15.22		Install	No	1	R	R
15.23		Other network accessories, switches, routers etc. necessary for a complete SCADA system	Sum	1	R	R
		Workstation furniture				
15.24		Supply	Sum	1	R	R
15.25		Install	Sum	1	R	R
		New WWTW SCADA Software				
15.26		SCADA software for WWTW SCADA	Sum	1	R	R
15.27		Mimics Configuration	Sum	1	R	R
15.28		Alarm Management Software Licence	Sum	1	R	R
15.29		Alarms and Events Configuration	Sum	1	R	R
15.30		Report Configuration	Sum	1	R	R
15.31		Data logging and trends display configuration	Sum	1	R	R
15.32		Historian data warehousing - data analysis and reporting	Sum	1	R	R
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		CARRIED FROM PREVIOUS PAGE				R
15.33		Historian data business intelligence	Sum	1	R	R
15.34		SCADA security (firewall, intruder detection and anti-virus)	Sum	1	R	R
15.35		SCADA software: clients	No	3	R	R
15.36		Involvement of SCADA OEM for consultation, specification of architecture and commissioning assistance	Sum	1	R	R
15.37		All other software programming and configuration required for complete and secure SCADA system with hot standby	Sum	1	R	R
15.38		Testing and Commissioning of Complete SCADA system	Sum	1	R	R
15.39		SCADA training	hours	40	R	R
15.40		Delivery to site of equipment included under this Section	Sum	1	R	R
		Remote Municipal master SCADA update to include Lethabong WWTW. Allow for factory acceptance testing for two persons	-			
15.41		SCADA Development	Sum	1	R	R
15.42		Install	Sum	1	R	R
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		CARRIED FROM PREVIOUS PAGE				R
15.43		Testing and Commissioning	- Sum	1	R	R
		Dashboard. Allow for factory acceptance testing for two persons at Client's office	-			
15.44		Configure Dashboard for SCADA	- Sum	1	R	R
		Reporting complete with tags and SQL licensing. Allow for factory acceptance testing for two persons at Client's office	-			
15.45		Business intelligence reporting software	- Sum	1	R	R
15.46		Configure reports for SCADA	Sum	1	R	R
15.47		Allow for all costs and expenses in connection with the Site Delivery of items in this section	Sum	1	R	R
15.48		All other items not included above, but which are nevertheless necessary to meet the Specification and/or required for the proper, safe and effective operation of the plant (<i>Specify</i>)	-			
			Sum	1	R	R
		Allow for the cost (provisional sum) of returning to site if necessary and if ordered, in order to carry out tests on the plant.	P. Sum	1	R 100,000.00	R 100,000.00
		Allow a provisional sum for small items omitted from this section	P. Sum	1	R 150,000.00	R 150,000.00
		All other items not included above, but which are nevertheless necessary to meet the Specification and/or required for the proper, safe and effective operation of the plant (<i>Specify</i>)	Sum	1	R	R
15		TOTAL SECTION: I5 CARRIED TO SUMMARY				R

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Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		SECTION: I6 INSTRUMENTATION Allow for all the costs and expenses in connection with the design, manufacture, painting, supplying, delivery, offloading and storage of the following materials and equipment: Ultrasonic Flow Meter complete including sensors, transmitters, mounting materials and stands as required.				
I6.1		Supply	No	1	R	R
I6.2		Install	No	1	R	R
		Electromagnetic Flow Meter complete including sensors, transmitters, mounting materials and stands as required.				
I6.3		Supply	No	2	R	R
I6.4		Install	No	2	R	R
		Ultrasonic Level Transmitter complete including sensors, transmitters, mounting materials and stands as required.				
I6.5		Supply	No	1	R	R
I6.6		Install	No	1	R	R
		Flow Switch complete including mounting materials.				
I6.7		Supply	No	1	R	R
I6.8		Install	No	1	R	R
		Pressure Switch complete including mounting materials.				
		TOTAL SECTION: CARRIED TO NEXT PAGE				R

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Contractor

Witness 1

Witness 2

Item No	Payment Clause	Description	Unit	Qty	Rate R c	Amount R c
		CARRIED FROM PREVIOUS PAGE				R
I6.9		Supply	No	1	R	R
I6.10		Install	No	1	R	R
		All other items not included above, but which are nevertheless necessary to meet the Specification and/or required for the proper, safe and effective operation of the plant (<i>Specify</i>)				
I6		TOTAL SECTION: I6 CARRIED TO SUMMARY				R

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Contact Data

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Witness 2

Contractor

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Item No	Payment Clause	Short Description	Unit	Quantity	Rate R c	Amount R c
21.		DAYWORKS According to the Preamble to the Daywork Schedule:				
21.1		LABOUR				
		a) Artisan	h	1	R	Rate only
		b) Charge-hand Artisan	h	1	R	Rate only
		c) Skilled labourer	h	1	R	Rate only
		d) Unskilled labourer	h	1	R	Rate only
		e) Watching, etc. necessitated by day work (workmen only)	h	1	R	Rate only
21.2		PLANT				
		a) Crawler Tractor: 100 kW to 120 kW	h	1	R	Rate only
		b) Front-end Loader, pneumatic tyred or crawler type: Min. 60 kw	h	1	R	Rate only
		c) Flat bed truck 5T	h	1	R	Rate only
		d) Trench Excavator, pneumatic tyred or crawler type:				
		(i) Min. 60 kw	h	1	R	Rate only
		(ii) Min. 200 kw	h	1	R	Rate only
		e) Mobile crane: min 10 t	h	1	R	Rate only
		f) Tip Truck				
		(i) Min. 5 m3	h	1	R	Rate only
		(ii) Min. 10 m3	h	1	R	Rate only

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21.3	g) Compactor, vibrating plate type: Min. 100 kg	h	1	R	Rate only
	h) Pump for dewatering, nom. 75 mm to 100 mm:				
	(i) Centrifugal	h	30	R	Rate only
	(ii) Submersible	h	1	R	Rate only
	(iii) Well-point pump	h	1	R	Rate only
	i) Diesel generator: 15 to 20 kVA, 380V	h	1	R	Rate only
	HAND TOOLS : (Tenderer must complete rate and quantity)				
	a) Wheelbarrow	Day	1	R	Rate only
	b) Shovels	Day	1	R	Rate only
	c) Picks	Day	1	R	Rate only
	d) Rakes	Day	1	R	Rate only
	e) Handtampers	Day	1	R	Rate only
21.4	Mark up on materials for dayworks	%	_____		Rate only

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CONTRACT

PART C3: SCOPE OF WORKS

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Contractor

Witness 1

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C3: Scope of Work

1. DESCRIPTION OF THE WORKS

1.1 Employer's objectives

The Employer's objective is to upgrade the existing Lethabong Wastewater Treatment Works, to ensure that the works functions to meet the effluent discharge standards.

1.2 Overview of the works

The project will implement the following:

Civil Engineering:

Construction of the following Structures and Services:

1. Bulk excavation from structures listed below and filling and compaction of the balance of the Sludge Lagoons.
2. New Inlet Works for the full 10ML works.
3. New 8ML Biological Reactor
4. Two 26m diameter Secondary Clarifiers for the new 8ML upgrade
5. Additional Chlorine Contact Channels
6. New Chlorine Storage and dosage Building
7. New Sludge Drying Beds for the whole 10ML works
8. WAS and Scum pump stations
9. New MCC, Control and Server Building
10. Area and shelter for Emergency Generator
11. Lime Storage and Dosage Building at Inlet Works
12. Nightsoil Disposal Point

Internal Pipework and Manholes for the new works

Mechanical Engineering

1. Two Mechanical Screens and two Hand raked Screens
2. Screenings Washer fed by a Spiral Conveyor
3. Mechanical Grit Removal Pumps and Grit Classifier
4. Four 6m³ waste skips
5. One Ultrasonic and Three Magnetic Flow Meters
6. Parshall Flume

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Employer

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Witness 1

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Witness 2

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Contractor

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Witness 1

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Witness 2

7. Six Sluice Gates and overflow Weirs
8. Four 11Kw platform mounted Mixers
9. Five 55Kw vertical shaft slow speed Surface Aerators
10. Six Axial Flow mixed liquor Recycle Pumps
11. Two Submersible Pumps
12. Two centrifugal pumps for WAS removal with external piping and specials
13. Two rotating half Bridges with Sludge and Scum accumulation equipment attached and Stilling Chambers at Secondary Clarifiers.
14. Lime Dosing Equipment
15. Chlorine Dosing and Safety Equipment
16. GRP Grating

Electrical Engineering

1. The electrical scope of works shall comprise of the following items which are detailed in the subsequent sections.
2. Liaise with the supply authority (Eskom) to coordinate relocation and/or upgrade of existing MV supply, equipment, and re-commissioning. Upgrade of existing 315kVA transformer to 1000kVA transformer
3. Liaise with the Client's (Rustenburg Local Municipality) Electrical Department to coordinate installation of new MV equipment and commissioning.
4. LV Motor Control Centre (MCC)
5. LV Chlorine Chemical Dosing Local Control Panel (LCP)
6. Vendor packaged electrical control panels (covered under the mechanical section)
7. Field Control Stations
8. LV cables
9. Cable supports
10. Trenching
11. Earthing and bonding
12. 630kVA Standby Diesel Generator (canopy set)
13. Small power and lighting
14. 400V Small power and lighting distribution boards
15. Testing and commissioning of the electrical installation.
16. Certificates of compliance

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C1.2 Contact Data

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Witness 1

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17. As-built drawings
18. Operation and maintenance manuals
19. Training
20. Spares

NOTE TO TENDERERS: Tenderers should note that the scope works descriptions above are high level and that all minute details and works, materials, accessories etc required to achieve completion of the works described above are implied in the description of the works. Tenderers are to measure such material, accessories etc in their pricing

1.3 Location of the works

The Lethabong Wastewater Treatment Works is in Northwest Province on the western edge of Lethabong Township. It is located on the banks of the Hex River (see Location Plan in drawings).

The central locality coordinates of the works are as below:

LETHABONG WwTW

Longitude: (E) 27° 28' 06.4"

Latitude: (S) 25° 25' 39"

Altitude 1 012m Above Mean Sea Level

The site shall not only include the works area for the construction of the new services but shall be extended in the broader sense to take account of all areas occupied by the Contractor, be it deliberate or unintentional, in the execution of the contract. The location of the site camp and site access to be proposed by the successful tenderer and agreed by the Client and Engineer/Agent.

The limits of the project are as shown on the locality plan bound into the book of drawings to be received together with this document. The site shall not only include the works area for the refurbishment of the works but shall be extended in the broader sense to take account of all areas occupied by the Contractor, be it deliberate or unintentional, in the execution of the contract.

Choosing a location for the site camp shall be the responsibility of the successful tenderer assisted by the municipality.

1.4 Delivery of materials and equipment

It is the responsibility of the Contractor to take delivery, off-load, store and move into their permanent position all equipment and materials covered under this contract. The Contractor shall, at its own expense, be responsible for the delivery to the Site of imported plant and equipment, materials and Contractor's plant and equipment in connection with the execution of the works, including but not limited to securing of permits and customs clearances, and payment of handling costs, storage costs, releasing costs, transportation costs, and duties, taxes, imposts, excise and charges of any kind that may be imposed by the South African Government, or any of its agencies and political subdivisions relating to the supply and delivery to the Site of the imported plant and equipment, materials and Contractor's plant and equipment.

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2. Temporary Works

The Contractor shall, as relevant:

1. Clear site and surroundings to create accessible working areas as required
2. Provide temporary drainage works, temporary pumps and other equipment as may be necessary for the protection, draining and dewatering of the works.
3. Construct and maintain haulage, temporary access and construction roads with their required storm water systems, subject to the approval of the Employer, and permit the Employer, other Contractors, statutory bodies or any other person who might require legitimate access to or through the site for the purpose of executing legitimate business, free and unhindered usage of such roads. Where suitable, the primary haulage roads will be graded and re- gravelled where necessary towards the end of the contract to form a future maintenance road.
4. Temporary water connections, Contractor's offices, storage sheds, latrines, barricading of Works shall be in an approved position and subject to the approval of all authorities concerned.
5. Safety and security of the Contractors' temporary works shall be at the Contractors' discretion, but always in accordance with stipulated Occupational Health and Safety requirements.
6. The camp shall be adequately guarded during and outside working hours
7. The temporary works include:

- The works required to locate, verify and protect existing services within the works area.

The works must:

- Be such to ensure no or limited interruption to the operation of the existing Lethabong WwTW, and must further ensure limited interruption to vehicular and pedestrian traffic; and
- Be such that existing storm water flow shall not be impeded during survey and construction activities.

8. Protection of excavations

Further, the Contractor shall note that no stockpiling of materials, plant, excavated material or any other construction related infrastructure shall be allowed in locations that may interfere with the operations of the Employer and the public in general.

3. Procurement

3.1 Preferential procurement procedures

The works shall be executed in accordance with the conditions pertaining to preferences granted in accordance with the preferencing schedule.

3.2 Labour and Personnel

3.2.1 Contractors Personnel

The Contractor shall limit the utilisation of his permanently employed personnel to that of key personnel only on the Works, as defined below, and shall execute and complete the Works utilising a temporary workforce employed directly by the Contractor and/or by his sub-contractors, using the assistance of the Labour Desk(s), from the various communities that are established in proximity to the Works or which will be consumers from the Scheme.

Without derogating from the Contractor's obligations to complete the Works within the specified time for completion, the numbers in each category of the Contractor's key personnel, as stated by the Contractor in the Returnable Schedules, will be strictly controlled during the contract period and any increase in numbers will be subject to the prior approval of the Employer.

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Contractor

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Key personnel means all contracts managers, site agents, site clerks, materials and survey technicians, quantity surveyors, trainers, supervisors, foremen, skilled plant operators, brick layers, welders, shutter hands and the like, and all other personnel in the permanent employ of the Contractor or his sub-contractors who possess special skills, and/or who play key roles within the Contractor's or his subcontractor's operations.

The Engineer may at his discretion, upon receipt of a written and fully motivated application from the Contractor, and where he deems the circumstances so warrant, authorise in writing that the Contractor may utilise in the execution of the Works, workers not being his key personnel but who are in his permanent employ. Without limiting the generality of application of this sub-clause, circumstances which may be considered by the Engineer to warrant authorization of the use of the Contractor's permanent employees other than key personnel, include:

- a) The unavailability from local sources of sufficient numbers of temporary workers and/or sub-contractors to execute the Works provided always that the Contractor has satisfied the Engineer that he has exercised his best endeavours and taken all reasonable actions to recruit sufficient temporary workers and sub-contractors from local sources.
- b) The unavailability within the temporary worker pool and/or from subcontractor sources available to the Contractor in terms of the Contract, of sufficient skills necessary to execute the Works or specific portions thereof, in situations where the completion period allowed in the Contract is insufficient to facilitate the creation of the necessary skills through the provision of suitable training as contemplated in the Contract;
- c) Any other circumstances which the Engineer may deem as constituting a warrant.

3.2.2 Temporary Workforce

The Contractor shall employ labour from the local communities through the Labour Desk(s). Accordingly, the workforce that is employed on Site shall consist of local residents, except for approved key staff in the permanent employ of the Contractor, to the maximum extent that is compatible with the requirements of clause C3.2.1.

The Labour Desk(s) shall assist in identifying available local labour and, where available, semi-skilled labour as well as local sub-contractors. The Labour Desks shall also assist and advise regarding conditions of employment, disputes and disciplinary procedures. The function of the Labour Desk(s) shall however in no way diminish the responsibilities of the Contractor or sub-contractor.

The Contractor and its sub-contractor shall adhere to the statutory minimum wage rates, they are however at liberty to negotiate additional incentive payments based on performance.

A contract of employment or subcontract should be signed between the Contractor and each of his employees or sub-contractors, as the case may be. Likewise contracts of employment must be entered into between each such sub-contractor, and each of the specific subcontractor's employees. Employment and subcontract agreements shall make clear reference to at least the following conditions:

- The minimum agreed wage rate per hour in respect of labourers;
- The agreed pay rate per unit of production where applicable;
- UIF and WCA payments;
- Minimum working hours per day;
- Start and end times of a daily shift;
- Lunch break times;
- Company Policy regarding :
 - Rain time
 - Sickness and absenteeism
 - Disciplinary matters
 - Grievances
- Method and frequency of payment;
- Work clothes and safety equipment to be issued.

3.2.3 Local Content and Labour-Intensive Construction

The promotion of the use of local content is required in the execution of this project. This will be achieved by the use of local labour and local sub-contractors in the construction of works equivalent to twenty-five percent (30%) of the total cost of works are to be constructed. The following limits apply:

- Construction by subcontractors may constitute a maximum of 25% of the total local content works.
- Construction using labour intensive construction methods and employing locally (within Marikana and its surrounds) labour must make up 75% the total local content works.

Labour Intensive Construction shall mean the economically efficient employment of as great a portion of labour as is technically feasible to produce a standard of construction as demanded by the Specifications with completion by the Due Completion Date, thus the effective substitution of labour for equipment.

Appropriate portions of the Works included in the Contract shall be executed using labour intensive construction methods. These portions of the Works shall be constructed and supplemented only to the extent necessary and unavoidable by the Contractors key personnel, unless otherwise instructed by the Engineer.

The portions of the Works to be executed using labour intensive construction methods are:

- clearing and grubbing of the Site;
- Laying of interlocked block paving for road surfacing and sidewalk / channel.
- Installation of road signs
- exposing existing services;
- dismantling and re-erection of fences; and
- cleaning and tidying up of the Site.

In respect of those portions of works which are not listed above, the construction methods adopted and plant utilised shall be at the discretion of the Contractor, provided always that the construction methods adopted and plant utilised by the Contractor are appropriate in respect of the nature of the Works to be executed and the standards to be achieved in terms of the Contract.

3.2.4 Subcontracting

3.2.4.1 The Contractor shall sub-let to sub-contractors' appropriate portions of the works. A sub-contract agreement shall be signed between the contractor and each of its sub-contractors.

3.2.4.2 The Contractor shall be responsible for all work carried out by sub-contractors on his behalf. The Engineer will not liaise directly with any such sub-contractor, nor will he become involved in any problems and/or disputes related to payments, programming, workmanship, etc, unless provided for in the Conditions of Contract. Such problems and/or disputes shall remain the sole concern of the Contractor and his sub-contractors.

3.2.4.3 The Engineer may at his discretion, upon receipt of a written and fully motivated application from the Contractor, and where he deems the circumstances so warrant, and provided always that the Contractor has complied fully and in all respects with the provisions of the Contract pertaining to subletting to local sub-contractors or has utilised his best endeavours to comply therewith, authorise in writing that the Contractor may employ local residents with the sole intent of executing on-the-job training of such local residents to suitable levels of skill.

Without limiting the generality of application of this clause, circumstances which may be considered by the Engineer to warrant such authorization include:

- a) non-receipt of valid or acceptable tenders/quotations from local sub-contractors;
- b) serious default or failure of appointed local sub-contractors;

The Engineer shall not grant such authority in cases where it may reasonably be concluded on the available evidence that the invitation of further tenders/quotations in accordance with the terms of the Contract is likely to result in the successful completion of the portions of the Works concerned by sub-contractors.

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Should the Contractor, after suitable due endeavour, be unable to identify sub-contractors for portions of the Works as specified, then the Contractor shall be permitted to undertake the Works in question with his own workforce as provided for above.

The Engineer shall monitor progress achieved with subcontractor training, and successful completion of this training shall be subject to his approval or instruction. The Contractor shall tender rates for the training of sub-contractors and labour.

3.2.4.4 The Contractor shall approach the Labour Desk that is established for purposes of the Contract for assistance and advice regarding conditions of employment, minimum wages, disputes and disciplinary procedures in respect of local sub-contractors.

3.2.5 Sub-contractor

To qualify as a sub-contractor the following requirements shall be applicable:

- Registration with the CIDB in the min class of CE registration applicable for a particular amount of work
- Submit an original valid Tax Clearance Certificate (in terms of the Preferential Procurement Regulations, 2011 published in Government Gazette No. 34350 dated 8 June 2011),
- Submit a valid VAT Registration Certificate (if VAT number is not included in tax clearance certificate),
- Submit a valid Workmen's Compensation Certificate, Act 4 of 2002,
- Submit a valid Unemployment Insurance Certificate, Act 4 of 2002,
- Submit a Certificate of Incorporation (if a Company),
- Submit a Founding Statement (if a Closed Corporation),
- Submit a Partnership Agreement (if a Partnership),
- Submit an Identity Document (if a One-man concern),
- Submit a Joint Venture Agreement (if a Joint Venture),
- Submit monthly proof of SARS PAYE in respect of all labourers
- Submit a Curriculum vitae of the person who prepares the Health and Safety Plan,
- Curriculum vitae of the Health and Safety Officer to be appointing in accordance with the Occupational Health and Safety Act (Act 85 of 1993).
- Provide all work clothes, safety equipment and tools required for the execution of the Works
- The minimum amount of liability insurance cover required will be R 1 000 00.00 per event, the number of events being unlimited.
- Payment of all amounts due to the local sub-contractor by the Contractor shall be subject to a the same retention conditions as applicable the Contractor.
- The sub-contractor shall deliver to the Contractor a performance guarantee of an insurance company or a bank to be jointly and severally bound with the sub-contractor for an amount equal to the same guarantee conditions as applicable to the Contractor
- Submit payments certificates to the Contractor at a frequency of once a month with payment made by the Contractor within seven days after the Employer paid the Contractor.
- The Contractor and its sub-contractor shall enter into a SAFCEC (or similar) sub-contract agreement.

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C3.2 STANDARD SPECIFICATIONS

The Standard specifications on which this contract is based are the standardized specifications for Civil Engineering Construction (SABS 1200) of the South African Bureau of Standard (SABS).

The following SABS 1200 Standard Specifications for Civil Engineering Construction shall form part of this contract and are available at the expense of the Contractor from the SA Bureau of Standards, Private Bag X191 Pretoria, 0001:

AA	General (Small Works)
AB	Engineer's Office
C	Site Clearance
DA	Earthworks (Small Works)
DB	Earthworks (Pipe trenches)
G	Concrete (Structural)
GA	Concrete (Small Works)
H	Structural Steel Works
L	Medium Pressure Pipelines
LB	Bedding (Pipes)
LD	Sewers

Other Standard Specifications

SABS 0162	Code of Practice for Structural Steelwork. The Machinery and Occupational Safety Act (Act No. 6 of 1983) as amended
SANS 10396: 2003:	Implementing Preferential Construction Procurement Policies using Targeted Procurement Procedures
SANS 1914-1 to 6 (2002):	Targeted Construction Procurement
SANS 1921 – 1 (2004):	Construction and Management Requirements for Works Contracts Part 1: General Engineering and Construction Works
and where accommodation of traffic is involved:	
SANS 1921-2 (2004):	Construction and Management Requirements for Works Contracts Part 2: Accommodation of Traffic on Public Roads Occupied by the Contractor.

C3.2.1 Applicable SANS standards

The following SANS specifications are also referred to in this document and the Contractor is advised to obtain them from Standards South Africa (a division of SANS) in Pretoria.

- SANS 2001-CC1: 2007 (Edition 1): South African National Standard, Construction Works, Part CC1: Concrete Works (structural)
- SANS 10396: 2003: Implementing Preferential Construction Procurement Policies using Targeted Procurement Procedures
- SANS 1914-1 (2002): Targeted Construction Procurement

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- SANS 1921-1 (2004): Construction and Management Requirements for Works Contracts Part 1: General Engineering and Construction Works
- SANS 1921-6 (2004): Construction and Management Requirements for Works Contracts Part 6: HIV / AIDS Awareness

The standardised specifications (SANS 1200) must be read in conjunction with the new SANS 1921 family of standards. In case of any discrepancy or conflict between the two, the SANS 1200 specification shall take precedence and shall govern.

The term “project specifications” appearing in any of the SANS 1200 standardised specifications is deemed to be equivalent to the term “scope of work” in SANS Specifications.

C3.2.2 Applicable SANS 1921 Standards

The following SANS 1921 Construction and Management requirements for works standards and associated specification data are applicable:

SANS 1921-1 General engineering and construction works
 SANS 1921-3 Steelworks
 SANS 1921-6 HIV/AIDS awareness

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C3.3 PROJECT SPECIFICATIONS

STATUS

The project specifications, consists of three parts for Civil, Mechanical and Electrical and forms an integral part of the contract and supplements the standard specifications.

Part A1 contains a general description of the civil works, the site and the management requirements to be met and detailed project specifications.

Part A2 contains variations, amendments and additions to the standard civil specifications.

Part A3 contains particular civil specifications.

Part B1 contains the standard mechanical specifications.

Part B2 contains the particular mechanical specifications.

Part C1 contains the standard electrical specifications.

Part C2 contains the particular electric specifications.

In the event of any discrepancy between a part or parts of the standardized or particular specifications and the project specification, the project specification shall take precedence. In the event of a discrepancy between the specifications, (including the project specifications) and the drawings and / or the bill of quantities, the discrepancy shall be resolved by the engineer before the execution of the work under the relevant item.

The standard specifications which form part of this contract have been written to cover all phases of work normally required for road contracts, and they may therefore cover items not applicable to this particular contract.

DEFINITIONS

For the purpose of this Contract the following shall have the associated meaning:

1. Unless inconsistent with the context, an expression which denotes:
 - a. Any gender includes the other genders;
 - b. A natural person includes a juristic person and vice versa; and
 - c. The singular includes the plural and vice versa.
2. 'Service Provider' shall mean either a consultant or contractor appointed to provide a particular service, i.e. investigations, design, labour provision and/or construction.
3. 'VAT' shall mean Value Added Tax in terms of the Value Added Tax Act 89 of 1991 as amended.
4. All references to 'Engineer' in the Specifications shall be understood to refer to the 'Employer's Agent' as defined in the Conditions of Contract.

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PART A: CIVIL

PART A1 GENERAL DESCRIPTION OF THE CIVIL WORKS, THE SITE AND THE MANAGEMENT REQUIREMENTS

CONSTRUCTION AND MANAGEMENT REQUIREMENTS

General

This section of the Contract documents should be read together with all other sections and Standardized, and Particular Specifications included in the Contract documents or Standardized Specifications mentioned in the Contract documents, but separately available. The documents should be read and interpreted jointly in order to determine the full requirements of the Contract

Certain aspects however require further attention as described hereafter.

Information Required at Tender Stage

It is a specific requirement of the tender that full information of all the equipment offered must be supplied at the time of tendering for the Engineer to evaluate the Tenderer's submission. In this regard, the Tenderer shall complete all technical schedules issued as part of the tender document.

2 Drawings

2.1 Employer's Design

The permanent works included in this contract has been designed by the Employer. The detail of the works is indicated on the drawings and in the specifications. The Tenderer may submit alternative offers for designs prepared by him subject to the conditions specified in the Contract Data.

2.2 Drawings

Drawings are bound into this document.

The reduced drawings form part of the tender documents as mentioned under Part T1 and shall be used for tendering purposes only.

The contractor shall be supplied with two complete paper copies of the construction drawings free of charge. The Contractor shall at his own expense re-produce further paper prints required for the construction of the work.

At the completion of the Contract, the Contractor shall return to the Engineer all drawings, provided or made, during the contract period.

Any information which the Contractor has control over and which is required by the Resident Engineer to complete the as built drawings shall be made available to the Resident Engineer before the Certificate of Completion is issued.

Only written dimensions may be used. Dimensions are not to be scaled from drawings unless ordered by the Engineer. The Engineer will supply all figures / dimensions which are not shown on the drawings. The levels or dimensions given on the drawings are subject to confirmation on site. The Contractor shall submit all levels and dimensions to the Engineer for confirmation before he commences with any structural construction work. The Contractor shall also check all dimensions which are given on the drawings and inform the Engineer of any conflicting dimensions.

For the portions of the Works designed by the Contractor (such as final pipe items and fittings), the latter shall furnish the Engineer with a full set of working drawings showing the exact dimensions and details of equipment to be manufactured. The drawings must be approved by the Engineer before manufacture of the equipment commences. Once satisfied, the Engineer shall approve the drawings in principle, which shall not relieve the Contractor from his responsibility to execute the Works in terms of the Specification, correctness of the drawings and final dimensions of all manufactured items.

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Responsibilities for design and construction

The responsibility strategy followed in this contract shall be a design by the Employer.

The engineer responsible for the design in accordance with the specification is: Zonk Consulting Engineers.

The Contractor undertakes only construction based on designs issued by the Employer. The Contractor is to follow the specification, the design and construction drawings as laid out by the Employer.

Materials, samples and shop drawings

All materials required for incorporation into the permanent works are to be supplied by the Contractor. Where possible, these materials shall be sourced from within the area, considering availability of supply, price and continuity of supply. In-situ material can be used where suitable. Spoiling and spreading of material will not be permitted on site and suitable temporary stockpile areas must be identified by the Contractor and approved by the Engineer prior to stockpiling.

It is the responsibility of the Contractor to take delivery, off-load, store, and move into their permanent position all equipment and materials covered under this contract. The Contractor shall, at its own expense, be responsible for the delivery to the Site of imported plant and equipment, materials and Contractor's plant and equipment in connection with the execution of the works, including but not limited to securing of permits and customs clearances, and payment of handling costs, storage costs, releasing costs, transportation costs, and duties, taxes, imposts, excise and charges of any kind that may be imposed by the South African Government, or any of its agencies and political subdivisions relating to the supply and delivery to the Site of the imported plant and equipment, materials and Contractor's plant and equipment.

Temporary works

"Temporary works" does not include activities or facilities such as the provision of accommodation for the contractor and Engineer, temporary water and power supplies, shuttering, scaffolding and all equipment specified or necessary to complete the works specified and/or shown on the drawings and included for in the Bill of Quantities.

Temporary works shall include the provision of access to the sites of the works and include ramps into excavations for deploying labour and plant at the positions required. No temporary works have been allowed for.

Preliminary programme

The Contractor shall include with his tender a preliminary programme on the prescribed form to be completed by all Tenderers. The programme shall be in the form of a simplified bar chart with sufficient details to show clearly how the works will be performed within the time for completion as stated in the Contract Data.

Tenderers may submit tenders for an alternative Time for Completion in addition to a tender based on the initial tendered Time for Completion. Each such alternative tender shall include a preliminary programme similar to the programme above for the execution of the works and shall motivate his proposal clearly by stating all the financial implications of the alternative completion time.

The Contractor shall be deemed to have allowed fully in his tendered rates and prices as well as in his programme for all possible delays due to normal adverse weather conditions and special non-working days as specified in the Special Conditions of Contract, in the Project Specifications and in the Contract Data.

Time for Completion

The tenderer shall indicate under section C1.2.2: Data provided by Contractor the time within which the contract shall be completed.

Delay in Completion

The Contractor shall organise the Works in such a manner that no delays occur. Delays due to faulty organisation or lack or shortage of materials or labour or co-operation with other parties or to any other cause within the control of the Contractor will not be countenanced and full power is reserved by the Engineer to order the Contractor to expedite the work should the work, in the opinion of the Engineer, not progress in a satisfactory way.

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QUALITY ASSURANCE (QA) (READ WITH SANS 1921 – 1: 2004 CLAUSE 4.4)

The Contractor will be solely responsible to produce work that complies with the Specifications to the satisfaction of the Engineer. To this end it will be the full responsibility of the Contractor to institute an appropriate Quality Assurance (QA) system on site. The Engineer will audit the Contractor's quality assurance (QA) system on a regular basis to verify that adequate independent checks and tests are being carried out and to ensure that the Contractor's own control is sufficient to identify any possible quality problems which could cause a delay or failure.

The Contractor shall ensure that efficient supervisory staff, the required transport, instruments, equipment and tools are available to control the quality of his own workmanship in accordance with his QA-system. His attention is drawn to the fact that it is not the duty of the Engineer or the Engineer's representative to act as foreman or surveyor.

MANAGEMENT AND DISPOSAL OF WATER

The Contractor shall pay special attention to the management and disposal of water and storm water on the site. It is essential that all completed works or parts thereof are kept dry and properly drained. Claims for delay and for repair of damage caused to the works because of the Contractor's failure to properly manage rain and surface water, will not be considered.

EARTHWORKS

Process control

The Contractor shall arrange for his own process control tests. The Contractor must submit the results of tests carried out on materials and workmanship when submitting work for acceptance by the Engineer. The costs for these tests shall be deemed to be included in the relevant rates and no additional payment will be made for testing as required.

Acceptance control

The process control test results submitted by the Contractor for approval of materials and workmanship may be used by the Engineer for acceptance control. However, before accepting any work, the Engineer shall have his own acceptance control tests carried out by an approved laboratory. The cost of acceptance testing shall be to the account of the Employer.

SITE ESTABLISHMENT (READ WITH SANS 1921 - 1: 2004 CLAUSE 4.14)

Contractor's camp site and depot

The Contractor is responsible to provide a suitable site for his camp and to provide accommodation for his personnel, labourers, clerk of works and contracts manager. If the Employer can make any specific site available to the Contractor, such site will be pointed out to the Contractor. The construction yard will not be serviced, and the Contractor shall make arrangements to connect all necessary services to specific points.

The Contractor shall provide security watchmen for the contract as he deems fit at no extra cost for the Employer. The Contractor must ensure that all his employees as well as the employees of his subcontractors are able to identify themselves as members of the construction team.

The chosen site shall be subject to the approval of the Engineer and Employer. Possible locations for a campsite shall be pointed out at the Site Inspection. The Contractor shall conform to all local authority, environmental and industrial regulations.

Temporary and permanent fencing around the Contractor's Site establishment areas and electrical and mechanical apparatus connected to the electrical supply shall be erected by the Contractor where needed.

On completion of work on Site, buildings constructed by the Contractor for his own use shall be demolished, including foundations, and the ground reinstated. Underground services to these buildings shall be removed.

Covered accommodation for perishable or corrodible materials, fittings and the like shall be adequate and suitable for their purpose and, particularly in the case of cement stores, shall be well ventilated, weatherproof and waterproof with floors raised off the ground, so as to keep the materials perfectly dry and freely aerated.

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Power Supply

The Contractor shall make his own arrangements concerning the supply of electrical power at the contractor's campsite. No direct payment shall be made for the provision of electrical services. Electrical power cannot be guaranteed by the service provider. During power failures and shortages, the Contractor must make his own arrangements for the provision of electricity.

The rates tendered for the relevant items in the Preliminary and General Section of the schedule shall include all costs for the establishment and maintenance of a power supply to the works.

Water Supply and Sewage

The Contractor shall erect and maintain on the site proper ablution facilities. The Contractor shall service and maintain the facilities in a clean and hygienic state for the duration of the contract period and on completion of the works from the site.

The Contractor shall make his own arrangements concerning the supply of water and sewer disposal at the contractor's campsite. No direct payment shall be made for the provision of water or sewer disposal.

The Contractor must supply all necessary materials for the water connection at a position pointed out by the Engineer. The availability of water cannot be guaranteed by the Municipality and in the event of water no longer being freely available, the Contractor must make his own arrangements to acquire it.

The rates tendered for the relevant items in the Preliminary and General Section of the schedule shall include all costs for the establishment and maintenance of water supply to the works and the Contractor shall make his own arrangements for the possible conveyance and storage of water if necessary. The Contractor will be held responsible for any wastage of water due to negligence.

Accommodation of Employees

The Contractor will not be required to provide housing facilities for the Engineer's staff. No accommodation for the Contractor's employees will be permitted on site.

Water for construction

See PSA 1.5.3 above.

Facilities for the Engineer

See PSAB Engineers office under variations to the standard specifications

Telephone Facilities

Telephone and email facilities are needed on the site.

Setting out and Survey beacons (Read with SANS 1921 - 1: 2004 clause 4.15)

Before commencing the operations, the Contractor shall locate and mark all survey pegs and beacons and shall immediately submit a written report in duplicate of any missing or damaged pegs and beacons to the Engineer's, who shall verify the facts and return a countersigned copy of the report to the Contractor. Other than in the case of setting out pegs the Contractor will be held responsible for the replacement by a registered land surveyor of all beacons or pegs found damaged or missing on completion of the Works which were not reported as such by the Contractor before commencing operations.

Survey records of beacons, benchmarks, etc., replaced shall be submitted to the Engineer. Attention in this regard is drawn to Sections 35(1) and (2) of the Land Survey Act of 1927 which lays down the penalties applicable to those who are responsible for interfering with permanent survey beacons, benchmarks, reference marks or trigonometric stations.

The Contractor shall take special precautions to protect all permanent survey beacons or pegs such as bench-marks, stand boundary pegs and trigonometrical beacons, regardless whether such beacons or pegs were placed before or during the execution of the Contract. If any such beacons or pegs have been disturbed by the Contractor or his employees, the Contractor shall have them replaced by a registered land surveyor at his own cost.

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EXISTING SERVICES (READ WITH SANS 1921 - 1: 2004 CLAUSE 4.17)

The Contractor shall make himself acquainted with the position of all existing services before any excavation or other work likely to affect the existing services is commenced.

The Contractor will be held responsible for any damage to known existing services caused by or arising out of his operations and any damage shall be made good at his own expense. Damage to unknown services shall be repaired as soon as possible and liability shall be determined on site when such damage should occur.

All the work will be carried out on the site of the existing Lethabong WwTW and in the vicinity of existing services and all such services and the WwTW shall always remain in operation, except where arrangements have been made for the interruption of components of the WwTW or the service for the purposes of carrying out the Works under this Contract.

Existing overhead and underground services may be indicated on the drawings held by the respective service providers. Should the Contractor find evidence of possible buried services, he shall notify the Engineer immediately thereof. The Engineer will assess the situation and instruct the Contractor on an appropriate course of action to be taken.

The Contractor shall be responsible for checking the locations of all services and to ensure that no damage is caused by construction operations.

The Contractor, before starting any excavations or where indicated in the scope of work or site information that underground services either cross or are located adjacent to the Works that is to be constructed, such services shall be exposed by hand ahead of trenching operations to enable any changes that might be needed in the design of the pipelines to be made timeously. Care shall be taken in exposing such services to avoid damaging them. An item has been allowed for in the Bill of Materials for hand excavation or other methods to search for existing services.

All cables and pipes shall be considered "live" unless confirmed otherwise by the relevant service authority.

Services belonging to the following service owners will be encountered:

Service owner	Type of service
Eskom	Electrical/Power lines
Rustenburg Local Municipality	Sewer, water and electrical infrastructure

HEALTH AND SAFETY (READ WITH SANS 1921 - 1: 2004 CLAUSE 4.18)

General statement

It is a requirement of this contract that the Contractor shall provide a safe and healthy working environment and to direct all his activities in such a manner that his employees and any other persons, who may be directly affected by his activities, are not exposed to hazards to their health and safety. To this end the Contractor shall assume full responsibility to conform to all the provisions of the Occupational Health and Safety Act (OHSA) No 85 and Amendment Act No 181 of 1993, and the OHSA 1993 Construction Regulations 2014 issued on 08 February 2014 by the Department of Labour.

For this contract the Contractor is required to confirm his status as mandatory and employer in his own right for the execution of the contract by entering into an agreement with the Employer in terms of the Occupational Health and Safety Act in the form as included in section C1.1.7.

Health and Safety Specifications and Plans

Employer's Health and Safety Specification

A Health and Safety Specification is included in Section C5.2, of the tender documents.

Tenderer's Health and Safety Plan

The Tenderer shall submit with the tender his own documented Health and Safety Plan proposed to be implemented for the execution of the work under the contract. The Health and Safety Plan must at least cover the following:

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(a) a proper risk assessment of the works, risk items, work methods and procedures in terms of Regulations 7 to 28.

pro-active identification of potential hazards and unsafe working conditions.

provision of a safe working environment and equipment.

statements of methods to ensure the health and safety of subcontractors, employees and visitors to the site, including safety training in hazards and risk areas (Regulation 5).

monitoring health and safety on the site of works on a regular basis and keeping of records and registers as provided for in the Construction Regulations.

details of the Construction Supervisor, the Construction Safety Officers, and other competent persons he intends to appoint for the construction works in terms of Regulation 6 and other applicable regulations; and

details of methods to ensure that his Health and Safety Plan is carried out effectively in accordance with the Construction Regulations 2014.

The Contractor's Health and Safety Plan will be subject to approval by the Employer, or amendment, if necessary, before commencement of construction work. The Contractor will not be allowed to commence work, or his work will be suspended if he had already commenced work before he has obtained the Employer's written approval of his Health and Safety Plan.

Time lost due to delayed commencement or suspension of the work because of the Contractor's failure to obtain approval for his safety plan, shall not be used as a reason to claim for extension of time or standing time and related costs

Cost of compliance with the OHSA Construction Regulations

The rates and prices tendered by the Contractor shall be deemed to include all costs for conforming to the requirements of the Act, the Construction Regulations and the Employer's Health and Safety Specification as applicable to this contract.

Should the Contractor fail to comply with the provisions of the Construction Regulations, he will be liable for penalties as provided in the Construction Regulations and in the Employer's Health and Safety Specification.

MANAGEMENT OF THE ENVIRONMENT (READ WITH SANS 1921 - 1: 2004 CLAUSE 4.19)

Respect for the environment is an important aspect of this contract and the Contractor shall pay special attention to the following:

Natural Vegetation

The Contractor shall confine his operation to the limits of the existing Lethabong WwTW for the purpose of constructing the works.

Only those trees and shrubs directly affected by the works and such others as the Engineer may direct in writing shall be cut down and stumped. The natural vegetation, grassing and other plants shall not be disturbed other than in areas where it is essential for the execution of the work or where directed by the Engineer.

Fires

The Contractor shall comply with the statutory and local fire regulations. He shall also take all necessary precautions to prevent any fires. In the event of fire the Contractor shall take active steps to limit and extinguish the fire and shall accept full responsibility for damages and claims resulting from such fires which may have been caused by him or his employees.

Environmental Management Plan

In addition to the above all requirements according to the Environmental Management Plan will be adhered to.

CONTRACT NAME BOARD

Two official contract name boards are required for this contract. One is to be located at the main road and one at the entrance to the Lethabong WwTW.

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RAILWAY FACILITIES

The nearest railway siding is Polokwane Railway Station.

SECURITY CLEARANCE OF PERSONNEL

Tenderers should note that the Rustenburg Local Municipality may require that Security Clearance investigations be conducted on any number of the Tenderer's personnel.

If so required, by the Rustenburg Local Municipality, the Tenderer must remove personnel as indicated immediately and ensure that they have no access to the works or documentation or any other information pertaining the site.

The Employer shall not be liable for any cost concerning the removal of personnel or the effect thereof on the execution of the work.

SUPPLY OF MATERIALS

All material to be used in the Works is to be supplied by the Contractor.

The Contractor shall ensure that the work is not delayed due to the lack of materials on Site, by placing orders for material required under this Contract as soon as possible. No extension of time will be allowed for any delay due to the supply of materials.

Although the quantities have been carefully calculated, it must be considered as approximate only and the Contractor, before ordering any materials, should check the quantities required. The bill of quantities is provisional.

EXECUTION OF THE WORKS

Inspection by the Engineer

No portion of the work shall be proceeded with until the Engineer or his representative has examined and approved the previous stage. If any work is covered or hidden from view before the Engineer or his representative has inspected the work, the Contractor shall at his own cost expose the covered or hidden work for inspection. The Contractor shall also be responsible for making good any work damaged during the uncovering.

Certificate of Completion

When all the work under the Contract have been completed to the entire satisfaction of the Engineer, he will issue a certificate of completion to the Contractor informing the Contractor of the date the date at which the works are deemed to be completed and accepted by the Employer.

The sureties provided by the Contractor for the fulfilment and completion of the Contract in terms of the Form of Agreement will be released upon the issue of the Certificate of Completion.

SOCIO-ECONOMIC DEVELOPMENT REQUIREMENTS

Definitions and criteria

- a) **"Actual %"** means Actual value (including adjustments in accordance with the Contract divided by the Contract Price.
- b) **"Local Project Steering Committee"** means the official community communication channel that was established by the municipality.

The PSC is to be the point of contact for all project SED related matters.

- c) **"Black People"** refers to the definition in the South African Broad Based Black Economic Empowerment Act, Act No 53 of 2003 as amended by section 1(b) of Act No. 46 of 2013.
- d) **"Black Women"** refers to women who are Black People as defined in the South African Broad Based Black Economic Empowerment Act, Act No 53 of 2003 as amended by section 1(b) of Act No. 46 of 2013.
- e) **"Black Owned"** refers to ownership of $\geq 51\%$ by Black People.

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- f) **“Contract Price”** refers to the definition under the GCC 2015 Clause 1.1.1.10
- g) **“Women Owned”** refers to ownership of ≥30% by Women.
- h) **“Exempted Micro Enterprise”** is any enterprise with an annual Total Revenue of R10 Million or less.
- i) **“Local”** means the Project Area.
- j) **“Qualifying Small Enterprise”** is any enterprise with an annual Total Revenue of between R10 million and R50 million.
- k) **“Small, Medium, Micro, Cooperative Enterprises”** is any enterprise that is an EME or a QSE.
- l) **“Staff Levels”** refer to the categorisation of staff utilised by the Contractor. All staff shall be assigned to one of the four levels defined as follows:
- **“Unskilled Labour”**: work which requires no special training or experience for performing the work adequately, such as manual heavy physical work.
 - **“Semi-skilled Labour”**: work which requires a degree of training and skill involving operating machinery or a construction trade, such as bricklaying, carpentry, steel fixing, welding, electrical work and plumbing while under supervision. This level shall include junior administrative staff.
 - **“Skilled Labour”**: work which requires special skill, training, knowledge, and ability to do unsupervised work and is typically supported by recognised certification as a Machine Operator, Certified Bricklayer, Carpenter, Steel Fixer, Welder, Electrician and Plumber. This level shall include senior administrative and on-site supervisory staff.
 - **“Professional and Management”**: work requiring higher-order skills than the Unskilled Labour, Semi-skilled Labour and Skilled Labour levels, being all staff who would typically be housed in the Management Camp.
- m) **“Youth”** are people under the age of 35.

Key resources

The Project Steering Committee (PSC) will identify a Community Liaison Officer (CLO) to facilitate liaison between the Contractor and the community and amongst other things to ensure that the employment of local labour proceeds smoothly.

All decisions regarding identification and hiring of labour, relieving labour of their duties, local problems and any other matter of local importance related to the Contract, will be made in consultation with the CLO.

The CLO needs at least a high school diploma and should have excellent communications skills (written and oral), the ability to work with a wide variety of people, and strong organizational skills. If possible, the CLO should be from the local communities closest to the Project.

There will be a CLO appointed by the Contractor, but nominated by the Ward Councillor/PSC, and accountable to the PSC.

SOCIO-ECONOMIC OBJECTIVES

The preference criteria for the Contract covers a broad range of parameters to obtain maximum benefit to Local people and companies. The objectives are to maximise:

- Procurement and employment opportunities Local suppliers and individuals.
- Skills and technology transfer through training of individuals.
- Participation by Black, small, medium-sized, and micro enterprises, and cooperatives.
- Implementation of the project in a socially responsible and sustainable manner.

The Employer is bound by legislative obligations in South Africa relating to employment, preferential procurement and enterprise development and skills development, aimed at contributing to economic growth and expansion of the supplier base in the construction sector in the Project Area, as follows:

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Employment

The Employer has the objective of ensuring that employment of labour conforms to the following principles:

- Employment of unskilled labour will be sourced from the Project Area.

Enterprise Development

The Employer aims to develop established QSEs and EMEs, (that are at least 51% Black Owned), to enable them to implement appropriate business management systems and be able to undertake future projects either independently or at JV partner level.

Training & Skills Development

The Employer is committed to the development of unskilled labour. To give effect to this objective, the Contractor is required to institute a training and skills development programme aimed primarily at improving the literacy and skills of site-based staff.

EMPLOYMENT

Employment Goals

The Contractor is to employ local labour that totals 1% of the Contract Price. The Contractor is to ensure that the labour employed is indeed local by making use of the CLO.

Implementation Requirements

Recruitment through the PSC and CLO

All local labour is to be employed with the assistance of the PSC through the CLO. The Contractor to ensure that the following is actioned:

- Obtain list from the CLO of people (with contact details) seeking employment.
 - If such a list is not available, the Contractor is set up a list with the assistance of the PSC and CLO.
- Advise the CLO of the successful applicants and when they are to report to site.
- Register and address employment process complaints.
- Keep a register of local staff employed and furnish details to the PSC and CLO; and
- Report on local labour recruitment, presents records and inform of any issues at monthly meetings.

Signs are to be placed on site that local people seeking employment should contact the CLO who will assist.

Labour Recruitment Process

The following steps shall be followed in the recruitment of unskilled labour:

- Registration of unskilled labour, in the Project Area, shall be done by the CLO.
- The Contractor will keep a list of applicants as submitted by the CLO to ensure appointments are on a first-come-first-served basis.
- The employment list must be presented to the community should it be required.
- The Contractor is to manage this list and update it as new positions are filled.
- The Contractor shall be responsible for the employment and induction process, including contracts of employment, health screening, confirmation of fitness to work, and induction training (The Contractor will be allowed to take a larger number than required, in the event that some candidates fail any of the above tests);
- The Contractor will provide written reasons for failure, in the case of health the detailed report will be confidential and will only be disclosed to the affected individual; and
- Good labour relations shall be maintained by employers and employees.

Labour Recruitment Requirements

The Contractor shall comply with the following requirements:

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- a) Abide by the Labour Recruitment Guidelines.
- b) Refrain from recruiting / bringing with them unskilled labour from outside the Project Area.
- c) Advertise vacant positions with the CLO and give people enough time to mobilise.
- d) Take responsibility for the employment and induction process, including contracts of employment, health screening, and confirmation of fitness to work. Should a candidate be judged unsuitable for the position the Contractor shall notify the CLO and PSC accordingly, with an explanation of its decision.
- e) Address recruitment complaints brought up from the CLO via the PSC.
- f) The Contractor shall pay his employees and shall ensure that his Subcontractors pay their employees rates of remuneration not less than that prescribed by legislation and applicable to the area of the Works.
- g) The Contractor, in the fulfilment of his obligations under the Contract, shall observe conditions of employment for those trades and occupations which are customary in the area in which the Works are to be constructed. The Contractor shall also practice and ensure that his Subcontractors practice a policy of equal remuneration, conditions of employment and benefits for people of equal skills and productivity.
- h) As and when required by the Engineer, the Contractor shall allow and shall ensure that his Subcontractors allow the Engineer to audit or to arrange an audit of the Contractor's or his Subcontractors' records and thereby monitor the performance by the Contractor of the obligations he has undertaken. In the event of the Engineer certifying that the Contractor has failed to carry out or has failed to ensure that his Subcontractors are carrying out any such obligations the Contractor shall make good the default certified by the Engineer within 14 days from such certificate.
- i) Notwithstanding anything elsewhere contained in the Contract, the Contractor shall recognise and ensure that his Subcontractors recognise the right and freedom of their respective employees to be members of trade unions of the employee's choice as may be permitted by legislation and the rights of such unions to bargain for improvement in the terms and conditions of employment of their members; and

SUB-CONTRACTING AND SUPPLIERS

Sub-contracting and Suppliers Goals

Actual procured spend on sub-contractors and supplier must be 30% of the Contract Price on Black-owned EMEs and QSEs and must be spent on Local Black-Owned QSEs, EMEs or companies.

For avoidance of doubt the procurement spend shall be calculated per category as a percentage of total Contract Price.

Implementation Requirements

The Contractor shall, within 28 days of the date of the Letter of Acceptance, make available to the Engineer, for evaluation, his elaborated and fully detailed Preferential Procurement Plan outlining the companies that will be sub-contracted or used for procurement of supplies. The list of companies must provide proof of being Black-owned and Local. Upon acceptance by the Engineer of the Contractor's Preferential Procurement Plan the Contractor may commence procurement from his approved vendors.

ENTERPRISE DEVELOPMENT

There are no Enterprise Development goals.

SKILLS DEVELOPMENT

Skills Development Goals

Unskilled Labour is to be provided with formal training.

Implementation Requirements

The Contractor is required to cooperate with the specified Training Provider.

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MONITORING AND REPORTING

General

Preference targets shall be addressed throughout the contract and shall be reported monthly in the Contractor's Monthly Report using the pro forma templates to be provided by the Employer.

Monitoring of Employment

A form, in accordance with the template to be provided by the Employer, must be submitted with the Monthly Report.

Monitoring of Sub-contractors and Supplier

A form, in accordance with the template to be provided by the Employer, must be submitted with the Monthly Report.

Monitoring of Enterprise Development

No monitoring will be done as there are no Enterprise Development goals.

Monitoring of Skills Development

A form, in accordance with the template to be provided by the Employer, must be submitted with the Monthly Report.

PENALTIES IN RELATION TO PREFERENCE

Actual Performance Against Contract Goals for Preference

The penalties for not achieving the above goals will be calculated as follows:

Labour Goals: $P_L = 0.015F - L_s$

Sub – contracting and Supplier Goals: $P_S = 0.075F - S_s$

Total Penalty: $P_P = P_L + P_S$

Where:

F = Contract Price
P_L = Penalty for not meeting Local Labour goals
L_s = Actual spend on Local Labour as per goals
P_S = Penalty for not meeting sub-contractor and supplier goals
S_s = Actual spend on Sub-contractors and Suppliers as per goals
P_P = Total Penalty applied

- Note that the following limits apply to the above penalties: Should the actual spend exceed the target the Contractor will not be reimbursed the difference as the targets are minimums.

EXPANDED PUBLIC WORKS PROGRAMME (EPWP) LABOUR INTENSIVE SPECIFICATION (Read with SANS 1914 -5 2002 and Guidelines for the implementation of Labour-Intensive Infrastructure Projects under the Expanded Public Works Programme (EPWP) third edition 2015)

Labour-intensive works

Labour-intensive works shall be constructed/maintained using local workers who are temporarily employed in terms of this Scope of Work.

As much as is economically feasible all work shall be implemented by employing Labour Intensive Construction methods. Over and above the normal Building and Allied works to be implemented by employing skilled and unskilled labour the works specified in the "Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the Expanded Public Works Programme (EPWP)" shall be undertaken using Labour Intensive Construction methods.

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The work will be carried using Labour- Intensive approach as much as possible. Labour-intensive works comprise the activities described in SANS 1921-5, Earthworks activities which are to be performed by hand, and its associated specification data. Such works shall be Constructed using local workers who are temporarily employed in terms of this Scope of Work.

Transport for Local Labour

The Contractor is required to provide transport each working day for all employed local labour from a central location within 1km of their place of residence, to the Site, and back again.

Labour intensive competencies of supervisory and management staff

Contractors having a relevant CIDB Contractor grading designation shall engage supervisory and management staff in labour intensive works who have either completed, or for the period 1 April 2004 to 30 June 2006, are registered for training towards, the skills programme outlined in Table 1.

Table 1: Skills programme for supervisory and management staff

Personnel	NQF level	Unit standard titles	Skills programme description
Foreman/ supervisor	4	Implement labour Intensive Construction Systems and Techniques or the equivalent QCTO qualification	This unit standard must be completed, and
		Use Labour Intensive Construction Methods to Construct and Maintain Roads and Storm water Drainage or the equivalent QCTO qualification	any one of these 3 unit standards
		Use Labour Intensive Construction Methods to Construct and Maintain Water and Sanitation Services or the equivalent QCTO qualification	
		Use Labour Intensive Construction Methods to Construct, Repair and Maintain Structures or the equivalent QCTO qualification	
Site Agent / Manager (i.e. the Contractor's most senior representative that is resident on the site)	5	Manage Labour Intensive Construction Processes or the equivalent QCTO qualification	Skills Programme against this single unit standard or part qualification

Labour Regulations

Payment for the labour-intensive component of the works

Payment for works identified as being labour-intensive shall only be made in accordance with the provisions of the Contract if the works are constructed strictly in accordance with the provisions of the scope of work. Any non-payment for such works shall not relieve the Contractor in any way from his obligations either in contract or in delict.

Applicable labour laws

The Ministerial Determination for Special Public Works Programmes, issued in terms of the Basic Conditions of Employment Act of 1997 by the Minister of Labour in Government Notice No R949 in Government Gazette 33665 of 22 October 2010, as reproduced below, shall apply to works described in the scope of work as being labour intensive and which are undertaken by unskilled or semi-skilled workers.

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Introduction

This document contains the standard terms and conditions for workers employed in elementary occupations on a Special Public Works Programme (SPWP). These terms and conditions do NOT apply to persons employed in the supervision and management of a SPWP.

In this document:

(b) “department” means any department of the State, implementing agent or contractor.

“employer” means any department, implementing agency or contractor that hires workers to work in elementary occupations on a SPWP.

“worker” means any person working in an elementary occupation on a SPWP.

“elementary occupation” means any occupation involving unskilled or semi-skilled work;

“management” means any person employed by a department or implementing agency to administer or execute an SPWP.

“task” means a fixed quantity of work.

“task-based work” means work in which a worker is paid a fixed rate for performing a task;

“task-rated worker” means a worker paid on the basis of the number of tasks completed;

“time-rated worker” means a worker paid on the basis of the length of time worked.

Terms of Work

Workers on a SPWP are employed on a temporary basis.

A worker may NOT be employed for longer than 24 months in any five-year cycle on a SPWP.

Employment on a SPWP does not qualify as employment as a contributor for the purposes of the Unemployment Insurance Act 30 of 1966.

Normal Hours of Work

An employer may not set tasks or hours of work that require a worker to work:

(c) more than forty hours in any week

on more than five days in any week; and

for more than eight hours on any day.

An employer and worker may agree that a worker will work four days per week. The worker may then work up to ten hours per day.

A task-rated worker may not work more than a total of 55 hours in any week to complete the tasks allocated (based on a 40-hour week) to that worker.

Meal Breaks

A worker may not work for more than five hours without taking a meal break of at least thirty minutes duration.

An employer and worker may agree on longer meal breaks.

A worker may not work during a meal break. However, an employer may require a worker to perform duties during a meal break if those duties cannot be left unattended and cannot be performed by another worker. An employer must take reasonable steps to ensure that a worker is relieved of his or her duties during the meal break.

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A worker is not entitled to payment for the period of a meal break. However, a worker who is paid on the basis of time worked must be paid if the worker is required to work or to be available for work during the meal break.

Special Conditions for Security Guards

A security guard may work up to 55 hours per week and up to eleven hours per day.

A security guard who works more than ten hours per day must have a meal break of at least one hour or two breaks of at least 30 minutes each.

Daily Rest Period

Every worker is entitled to a daily rest period of at least eight consecutive hours. The daily rest period is measured from the time the worker ends work on one day until the time the worker starts work on the next day.

Weekly Rest Period

Every worker must have two days off every week. A worker may only work on their day off to perform work which must be done without delay and cannot be performed by workers during their ordinary hours of work ("emergency work").

Work on Sundays and Public Holidays

A worker may only work on a Sunday or public holiday to perform emergency or security work. Work on Sundays is paid at the ordinary rate of pay.

A task-rated worker who works on a public holiday must be paid –

(d) the worker's daily task rate, if the worker works for less than four hours;

double the worker's daily task rate if the worker works for more than four hours.

A time-rated worker who works on a public holiday must be paid –

(e) the worker's daily rate of pay, if the worker works for less than four hours on the public holiday;

double the worker's daily rate of pay if the worker works for more than four hours on the public holiday.

Sick Leave

Only workers who work four or more days per week have the right to claim sick-pay in terms of this clause.

A worker who is unable to work on account of illness or injury is entitled to claim one day's paid sick leave for every full month that the worker has worked in terms of a contract.

A worker may accumulate a maximum of twelve days' sick leave in a year.

Accumulated sick-leave may not be transferred from one contract to another contract.

An employer must pay a task-rated worker the worker's daily task rate for a day's sick leave.

An employer must pay a time-rated worker the worker's daily rate of pay for a day's sick leave.

An employer must pay a worker sick pay on the worker's usual payday.

Before paying sick-pay, an employer may require a worker to produce a certificate stating that the worker was unable to work on account of sickness or injury if the worker is –

(f) absent from work for more than two consecutive days: or

absent from work on more than two occasions in any eight-week period.

A medical certificate must be issued and signed by a medical practitioner, a qualified nurse or a clinic staff member authorised to issue medical certificates indicating the duration and reason for incapacity.

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A worker is not entitled to paid sick leave for a work-related injury or occupational disease for which the worker can claim compensation under the Compensation for Occupational Injuries and Diseases Act.

Maternity Leave

A worker may take up to four consecutive months' unpaid maternity leave.

A worker is not entitled to any payment or employment-related benefits during maternity leave.

A worker must give her employer reasonable notice of when she will start maternity leave and when she will return to work.

A worker is not required to take the full period of maternity leave. However, a worker may not work for four weeks before the expected date of birth of her child or for six weeks after the birth of her child, unless a medical practitioner, midwife or qualified nurse certifies that she is fit to do so.

A worker may begin maternity leave –

(g) four weeks before the expected date of birth; or

on an earlier date –

if a medical practitioner, midwife or certified nurse certifies that it is necessary for the health of the worker or that of her unborn child; or

if agreed to between employer and worker; or

on a later date, if a medical practitioner, midwife or certified nurse has certified that the worker is able to continue to work without endangering her health.

A worker who has a miscarriage during the third trimester of pregnancy or bears a stillborn child may take maternity leave for up to six weeks after the miscarriage or stillbirth.

A worker who returns to work after maternity leave, has the right to start a new cycle of twenty-four months employment, unless the SPWP on which she was employed has ended.

Family responsibility leave

Workers, who work for at least four days per week, are entitled to three days paid family responsibility leave each year in the following circumstances -

(h) when the employee's child is born.

when the employee's child is sick.

in the event of a death of –

the employee's spouse or life partner.

the employee's parent, adoptive parent, grandparent, child, adopted child, grandchild, or sibling.

Statement of Conditions

An employer must give a worker a statement containing the following details at the start of employment–

(i) the employer's name and address and the name of the SPWP.

the tasks or job that the worker is to perform; and

the period for which the worker is hired or, if this is not certain, the expected duration of the contract.

the worker's rate of pay and how this is to be calculated.

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the training that the worker will receive during the SPWP.

An employer must ensure that these terms are explained in a suitable language to any employee who is unable to read the statement.

An employer must supply each worker with a copy of these conditions of employment.

Keeping Records

Every employer must keep a written record of at least the following –

(j) the worker’s name and position.

in the case of a task-rated worker, the number of tasks completed by the worker.

in the case of a time-rated worker, the time worked by the worker.

payments made to each worker.

The employer must keep this record for a period of at least three years after the completion of the SPWP.

Payment

An employer must pay all wages at least monthly in cash or by cheque or into a bank account.

A task-rated worker will only be paid for tasks that have been completed.

An employer must pay a task-rated worker within five weeks of the work being completed and the work having been approved by the manager or the contractor having submitted an invoice to the employer.

A time-rated worker will be paid at the end of each month.

Payment must be made in cash, by cheque or by direct deposit into a bank account designated by the worker.

Payment in cash or by cheque must take place –

(k) at the workplace or at a place agreed to by the worker.

during the worker’s working hours or within fifteen minutes of the start or finish of work.

in a sealed envelope which becomes the property of the worker.

Information in writing

An employer must give a worker the following information in writing –

(l) the period for which payment is made.

the numbers of tasks completed, or hours worked.

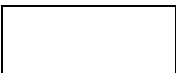
the worker’s earnings.

any money deducted from the payment.

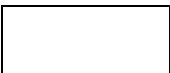
the actual amount paid to the worker.

If the worker is paid in cash or by cheque, this information must be recorded on the envelope and the worker must acknowledge receipt of payment by signing for it

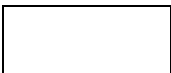
If a worker’s employment is terminated, the employer must pay all monies owing to that worker within one month of the termination of employment.



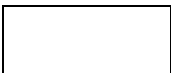
Employer



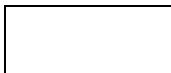
Witness 1



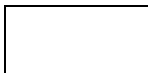
Witness 2



Contractor



Witness 1



Witness 2

Deductions

An employer may not deduct money from a worker's payment unless the deduction is required in terms of a law.

An employer must deduct and pay to the SA Revenue Services any income tax that the worker is required to pay.

An employer who deducts money from a worker's pay for payment to another person must pay the money to that person within the time period and other requirements specified in the agreement law, court order or arbitration award concerned.

An employer may not require or allow a worker to –

(m) repay any payment except an overpayment previously made by the employer by mistake.

state that the worker received a greater amount of money than the employer actually paid to the worker; or

pay the employer or any other person for having been employed.

Health and Safety

Employers must take all reasonable steps to ensure that the working environment is healthy and safe.

A worker must –

(n) work in a way that does not endanger his/her health and safety or that of any other person.

obey any health and safety instruction.

obey all health and safety rules of the SPWP.

use any personal protective equipment or clothing issued by the employer.

report any accident, near-miss incident or dangerous behaviour by another person to their employer or manager.

Compensation for Injuries and Diseases

It is the responsibility of the employers (other than a contractor) to arrange for all persons employed on a SPWP to be covered in terms of the Compensation for Occupational Injuries and Diseases Act, 130 of 1993.

A worker must report any work-related injury or occupational disease to their employer or manager.

The employer must report the accident or disease to the Compensation Commissioner.

An employer must pay a worker who is unable to work because of an injury caused by an accident at work 75% of their earnings for up to three months. The employer will be refunded this amount by the Compensation Commissioner. This does NOT apply to injuries caused by accidents outside the workplace such as road accidents or accidents at home.

Termination

The employer may terminate the employment of a worker for good cause after following a fair procedure.

A worker will not receive severance pay on termination.

A worker is not required to give notice to terminate employment. However, a worker who wishes to resign should advise the employer in advance to allow the employer to find a replacement.

A worker who is absent for more than three consecutive days without informing the employer of an intention to return to work will have terminated the contract. However, the worker may be re-engaged if a position becomes available for the balance of the 24-month period.

A worker who does not attend required training events, without good reason, will have terminated the contract. However, the worker may be re-engaged if a position becomes available for the balance of the 24-month period.

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Certificate of Service

On termination of employment, a worker is entitled to a certificate stating –

(o) the worker's full name.

the name and address of the employer.

the SPWP on which the worker worked.

the work performed by the worker.

any training received by the worker as part of the SPWP.

the period for which the worker worked on the SPWP.

any other information agreed on by the employer and worker.

Contractor's default in payment to Labourers and Employees

Any dispute between the Contractor and labourers, regarding delayed payment or default in payment of fair wages, if not resolved immediately may compel the Employer to intervene.

The Employer may, upon the Contractor defaulting payment, pay the moneys due to the workers not honoured in time, out of any moneys due or which may become due to the Contractor under the Contract.

Provision of Hand tools

The Contractor shall provide his labour force with hand tools of adequate quality, sufficient in numbers and make the necessary provisions to maintain the tools in good and safe working conditions

Reporting

The Contractor shall submit monthly returns/reports as specified below:

(p) Signed Muster rolls/pay sheets of temporary workers and permanent staff detailing the number, category, gender, rate of pay and daily attendance.

Copies of identity documents of workers

Number of persons who have attended training including nature and duration of training provided

Assets created, rehabilitated or maintained in accordance with indicators in the EPWP M&E framework

Plant utilization returns

Progress report detailing production output compared to the programme of works

EMPLOYMENT OF UNSKILLED AND SEMI-SKILLED WORKERS IN LABOUR-INTENSIVE WORKS

Requirements for the sourcing and engagement of labour.

Unskilled and semi-skilled labour required for the execution of all labour-intensive works shall be engaged strictly in accordance with prevailing legislation and SANS 1914-5, Participation of Targeted Labour.

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The rate of pay set for the project is R 191.60 per day.

Tasks established by the Contractor must be such that:

(q) the average worker completes 5 tasks per week in 40 hours or less; and

the weakest worker completes 5 tasks per week in 55 hours or less. The Contractor must revise the time taken to complete a task whenever it is established that the time taken to complete a weekly task is not within the requirements of (c) above.

The Contractor shall, through all available community structures, inform the local community of the labour-intensive works and the employment opportunities presented thereby. Preference must be given to people with previous practical experience in construction and / or who come from households:

(r) where the head of the household has less than a primary school education.

that have less than one full time person earning an income.

where subsistence agriculture is the source of income.

those who are not in receipt of any social security pension income

Specific provisions pertaining to SANS 1914-5

Definitions

Targeted labour: Unemployed persons who are employed as local labour on the project.

Contract participation goals

There is no specified contract participation goal for the contract. The contract participation goal shall be measured in the performance of the contract to enable the employment provided to targeted labour to be quantified.

The wages and allowances used to calculate the contract participation goal shall, with respect to both time-rated and task rated workers, comprise all wages paid, and any training allowance paid in respect of agreed training programmes.

Terms and conditions for the engagement of targeted labour

Further to the provisions of clause 3.3.2 of SANS 1914-5, written contracts shall be entered into with targeted labour.

Variations to SANS 1914-5

The definition for net amount shall be amended as follows:

(s) Financial value of the contract upon completion, exclusive of any value added tax or sales tax which the law requires the employer to pay the Contractor.

(t) The schedule referred to in 5.2.2.3 shall in addition reflect the status of targeted labour as women, youth and persons with disabilities and the number of days of formal training provided to targeted labour.

Training of targeted labour

The Contractor shall provide all the necessary on-the-job training to targeted labour to enable such labour to master the basic work techniques required to undertake the work in accordance with the requirements of the contract in a manner that does not compromise worker health and safety.

The cost of the formal training of targeted labour, will be funded by the provincial office of the Department of Labour. This training should take place as close to the project site as practically possible. The Contractor, must access this training by informing the relevant provincial office of the Department of Labour in writing, within 14 days of being awarded the contract, of the likely number of persons that will undergo training and when such training is required. The employer must be furnished with a copy of this request.

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A copy of this training request made by the Contractor to the DOL provincial office must also be faxed to the EPWP Training Director in the Department of Public Works.

The Contractor shall be responsible for scheduling the training of workers and shall take all reasonable steps to ensure that each beneficiary is provided with a minimum of six (6) days of formal training if he/she is employed for 3 months or less and a minimum of ten (10) days if he she is employed for 4 months or more.

The Contractor shall do nothing to dissuade targeted labour from participating in training programmes.

An allowance equal to 100% of the task rate or daily rate shall be paid by the Contractor to workers who attend formal training, in terms of d above.

Proof of compliance with the requirements of b to f must be proven.

Typical construction work to be executed applying labour intensive principles

- Trenching for pipelines, cables and restricted soft excavations
- Pipe/ cable laying- Pipe/ cable backfilling
- Installation of pipe specials
- Building works and block paving
- Steel fixing
- Formwork
- Small concrete works
- Concrete placing
- Painting

Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2

PART A2: PSA2 - VARIATIONS TO THE STANDARD SPECIFICATIONS

PSA	GENERAL
PSAB	ENGINEER'S OFFICE
PSC	SITE CLEARANCE
PSD	EARTHWORKS
PSDB	EARTHWORKS (PIPE TRENCHES)
PSDM	EARTHWORKS (ROADS, SUBGRADE)
PSG	CONCRETE STRUCTURAL
PSHA	STRUCTURAL STEELWORK (Small Works)
PSHB	CLADDING AND SHEETING
PSHC	CORROSION PROTECTION OF STRUCTURAL STEEL
PSL	MEDIUM-PRESSURE PIPELINES
PSLB	BEDDING (PIPES)
PSLC	CABLE DUCTS
PSLD	SEWERS
PSLE	STORM WATER DRAINAGE
PSM	ROADS (GENERAL)
PSME	SUBBASE
PSMF	BASE
PSMK	KERBING AND CHANNELING

Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2

VARIATIONS TO STANDARDISED SPECIFICATIONS

The following variations and additions to the SANS 1200 Standardised Specifications. The prefix PS indicates an amendment to SANS 1200. The letters and numbers following these prefixes respectively indicate the relevant Standardised Specification and clause numbers in SANS 1200 to which the variation or addition there under applies.

PSA: GENERAL

(Applicable to SANS 1200 A)

PSA 1 SCOPE

REPLACE THE CONTENTS OF SUBCLAUSE 1.1, INCLUDING THE NOTES, WITH THE FOLLOWING:

"1.1 This specification covers requirements, principles and responsibilities of a general nature which are generally applicable to civil engineering construction and building works contracts, as well as the requirements for the Contractor's establishment on the Site."

PSA 2 INTERPRETATIONS

PSA 2.3 DEFINITIONS

IN THE OPENING PHRASE BETWEEN THE WORDS "SPECIFICATION" AND "THE FOLLOWING", INSERT THE WORDS "THE DEFINITIONS GIVEN IN THE CONDITIONS OF CONTRACT AND".

(a) General

ADD THE FOLLOWING DEFINITIONS:

"General Conditions' and 'Conditions of Contract': The General Conditions of Contract specified for use with this Contract, together with the Contract Data (GCC 2015) as applicable.

'Specified': As specified in the Standardized Specifications, the Drawings or the Project Specifications. 'Specifications' shall have the corresponding meaning."

(b) Measurement and payment

REPLACE THE DEFINITIONS FOR

"Fixed charge", "Time-related charge"

AND

"Value-related charge"

WITH THE FOLLOWING:

" 'Fixed charge': A charge that is not subject to adjustment on account of variations in the value of the Contract Price or the time allowed in the Contract for the completion of the work.

'Time-related charge': A charge, the amount of which varies in accordance with the Time for Completion of the Works, adjusted in accordance with the provisions of the Contract.

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'Value-related charge': A charge, the amount of which varies pro rata with the final value of the measured work executed and valued in accordance with the provisions of the Contract.' "

PSA 2.4 ABBREVIATIONS

(a) Abbreviations relating to standard documents

ADD THE FOLLOWING ABBREVIATION:

"CKS: SANS Co-ordinating Specification."

PSA 3 MATERIALS

PSA 3.1 QUALITY

ADD THE FOLLOWING AT THE END OF SUBCLAUSE 3.1:

"All manufactured materials supplied shall be new materials unless the contrary is specified. All materials specified to be in accordance with SANS Specifications shall bear the SANS mark, where such a mark is available for the type of product."

Materials bearing the SANS or BS mark will not be subjected to tests to determine whether they comply with the relevant specifications. The Engineer may in his discretion require any material not bearing such mark to be tested in accordance with the relevant specifications; should he do so the Contractor shall arrange for such tests to be carried out at the Contractor's cost by the South African Bureau of Standards or other approved body. Should the tests prove that any material complies with the Specifications the Contractor will be reimbursed the value of the testing body's account for carrying out the tests required by the Engineer.

PSA 3.3 Delay Due to Supply of Materials

Add the following new sub-clause:

The Contractor shall ensure that the work is not delayed, due to the lack of materials on the site of the works, by placing orders with suppliers for the materials required under this contract timeously.

The Contractor shall, by producing copies of written orders or written enquiries for supplies, prove to the satisfaction of the Engineer that any delay occasioned by non-availability of materials has been caused by the inability of suppliers to supply and not by his own lack of timely ordering or lack of exhaustive enquiry for supplies, before any extensions of the contract time will be allowed due to such delays.

PSA 4 PLANT

PSA 4.1 SILENCING OF PLANT

REPLACE THE CONTENTS OF SUBCLAUSE 4.1 WITH THE FOLLOWING:

"The Contractor's attention is drawn to the applicable regulations pertaining to noise and hearing conservation, framed under the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) as amended.

The Contractor shall always and at his own cost, be responsible for implementing all necessary steps to ensure full compliance with such regulations, including but not restricted to the provision and use of suitable and effective

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silencing devices for pneumatic tools and other plant which would otherwise cause a noise level in excess of that specified in the said regulations.

Where appropriate, the Contractor shall further, by means of temporary barriers, effectively isolate the source of such noise to comply with the said regulations."

PSA 4.2 CONTRACTOR'S OFFICES, STORES AND SERVICES

ADD THE FOLLOWING PARAGRAPH BEFORE THE EXISTING FIRST PARAGRAPH IN SUBCLAUSE 4.2:

"The Contractor's buildings, sheds and other facilities erected or utilised on the Site for the purposes of the Contract shall be fenced off and shall contain all offices, stores, workshops, testing laboratories, toilet facilities, etc. as may be required by the Contractor. The facilities shall always be kept in a neat and orderly condition.

No personnel may reside on the Site. Only night-watchmen may be on the Site after hours."

DELETE

"and first-aid services"

IN THE SECOND PARAGRAPH OF SUBCLAUSE 4.2 AND ADD THE FOLLOWING:

"The Contractor shall provide on the Site and near the actual locations where the work is being executed, one toilet per 10 workmen, which toilets shall be effectively screened from public view and their use enforced. Such toilets shall be relocated from time to time as the location of the work being executed changes, to ensure that easy access to the toilets is maintained.

The Contractor shall, where applicable, make all necessary arrangements and pay for the removal of night soil."

PSA 5 CONSTRUCTION

PSA 5.1 SURVEY

PSA 5.1.2 Preservation and replacement of survey beacons and pegs subject to the Land Survey Act

DELETE THE WORDS

"in the vicinity of boundaries"

IN THE SECOND SENTENCE OF SUBCLAUSE 5.1.2 AND REPLACE THE WORDS

"under the direction of"

IN THE SAME SENTENCE WITH

"in consultation and liaison with".

ADD THE FOLLOWING AFTER THE SECOND SENTENCE OF SUBCLAUSE 5.1.2:

"The Contractor and the Engineer shall record on the said list, their concurrence or disagreement (as the case may be) regarding the completeness and accuracy of the details recorded therein."

REPLACE THE THIRD SENTENCE OF SUBCLAUSE 5.1.2 WITH THE FOLLOWING:

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"At the completion of the Contract, the Contractor shall expose all pegs that were listed at the commencement of the construction as being in order and the Contractor shall arrange with a registered Land Surveyor for the checking of the positions of all such pegs and the replacement of those that the Land Surveyor's check reveals have become disturbed or damaged. The Contractor shall, as a precedent to the issue of the Certificate of Completion, provide to the Engineer, a certificate from the registered land surveyor, certifying that all the pegs listed at the commencement of construction in accordance with the provisions of this clause, have been checked and that those found to have been disturbed, damaged or destroyed have been replaced in their correct positions, all in accordance with the provisions of the said Act.

The costs of all checking, replacement and certification as aforesaid shall be entirely for the Contractor's account. This, with the provision always that the Contractor shall not be held liable for the cost of replacement of pegs which:

- (a) cannot reasonably be re-established in their original positions by reason of the finished dimensions of the permanent works, and
- (b) the Contractor can prove beyond reasonable doubt to the satisfaction of the Engineer, were disturbed, damaged or destroyed by others beyond his control."

PSA 5.3 PROTECTION OF EXISTING STRUCTURES

REPLACE

"Machinery and Occupational Safety Act, 1983 (Act No 6 of 1983)"

WITH

"Occupational Health and Safety Act, 1993 (Act No 85 of 1993), as amended,"

AND INSERT THE FOLLOWING AFTER "(ACT NO. 27 OF 1956)":

"as amended".

PSA 5.4 PROTECTION OF OVERHEAD AND UNDERGROUND SERVICES

REPLACE THE HEADING AND THE CONTENTS OF SUBCLAUSE 5.4 WITH THE FOLLOWING:

PSA 5.4 LOCATION AND PROTECTION OF EXISTING SERVICES

PSA 5.4.1 Location of existing services

Before commencing with any work in an area, the Contractor shall ascertain the presence and actual position of all services 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 Engineer, 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 Engineer 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, using appropriate methodologies, carefully expose the services at such positions as are agreed to by the Engineer, for the purposes of verifying the exact location and position of the services.

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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 SANS 1200 D (as amended) shall apply.

The aforesaid procedure shall also be followed in respect of services not shown on the drawings 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 previously mentioned 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 Engineer 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 previously mentioned provisions pertaining to locating, verifying and recording its position on the balance of the site shall apply. The Contractor shall notify the Engineer immediately when any such service is encountered or discovered on the Site.

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 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 to have been a known service in accordance with the provisions of this clause,

The Contractor shall also be liable for consequential damage regarding (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 using the said detecting and testing equipment, nor for any costs incurred in preparing and submitting to the Engineer the Drawings as aforesaid. These costs shall be deemed included in the Contractor's other tendered rates and prices included in the Contract.

Payment to the Contractor in respect of exposing services at the positions agreed by the Engineer 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 there from to the public and/or workmen, all in accordance with the requirements of the prevailing legislation and related regulations.

Unless otherwise instructed by the Engineer, 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 SANS 1200 DB should be observed. In other areas compaction is to be to 93% modified AASHTO density.

PSA 5.4.3 Alterations and repairs to existing services

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

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inform the Engineer, 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.

Should damage occur to any existing services, the Contractor shall immediately inform the Engineer, 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.

PSA 5.7

SAFETY

REPLACE THE CONTENTS OF SUBCLAUSE 5.7 WITH THE FOLLOWING:

"Pursuant to the provisions of the Conditions of Contract, and without in any way limiting the Contractor's obligations there under, 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 always be required to ensure compliance with the requirements of the Act ;
- (d) Implement all necessary measures to ensure compliance with the Act by all subcontractors engaged by the Contractor and their employees engaged on the works;
- (e) Full compliance with all other requirements pertaining to safety as may be specified in the Contract.

The Employer and the Engineer 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 Engineer may reasonably require.

Where any such investigations reveal, or where it comes to the Engineer'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 Engineer shall, in accordance with the provisions of Clause 5.11 (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 Engineer, 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 Engineer 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 5.13.1 (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 Engineer to act in terms of clause 9.2 (GCC 2015) and for the Employer to terminate the Contract in accordance with the further provisions of the said clause 9.2 (GCC 2015)

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Contractor

Witness 1

Witness 2

ADD THE FOLLOWING SUBCLAUSE TO CLAUSE 5:

PSA 5.9 SITE MEETINGS

The Contractor or his authorised agent will be required to attend regular site meetings, which shall normally be held once a month on dates and at times determined by the Engineer, but in any case, whenever reasonably required by the Engineer. Unless otherwise indicated in the Contract or instructed by the Engineer, such meetings shall be held at the Contractor's offices on the site. At such monthly meetings, matters such as general progress on the works, quality of work, problems, claims, payments, and safety shall be discussed, but not matters concerning the day-to-day running of the Contract.

PSA 5.9 Security

PSA 5.9.1 Security of Contractor's Plant and Personnel

The Tenderer shall note that, notwithstanding the insurances affected by the Employer, the Contractor shall be responsible for the effecting of safety and security of plant and personnel on and around the site of the works, and that no claims in this regard will be entertained by the Employer.

The Contractor's attention is drawn to the fact that the work is to be carried out in an area where there might be a high incidence of criminal activity.

The sum entered by the Contractor in the Schedule of Quantities for effecting of safety and security of plant and personnel on and around the site of the works shall be deemed to include full compensation for all the measures necessary to affect the safety and security.

PSA 6 TOLERANCES

ADD THE FOLLOWING SUBCLAUSE TO CLAUSE 6:

PSA 6.4 USE OF TOLERANCES

No guarantee is given that the full specified tolerances will be available independently of each other, and the Contractor is cautioned that the liberal or full use of any one or more of the tolerances may deprive him of the full or any use of tolerances relating to other aspects of the work.

Except where the contrary is specified, or when clearly not applicable, all quantities for measurement and payment shall be determined from the 'authorised' dimensions. These are specified dimensions or those shown on the Drawings or, if changed, as finally prescribed by the Engineer, without any allowance for the specified tolerances. Except if otherwise specified, all measurements for determining quantities for payment will be based on the 'authorised' dimensions.

If the work is constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, the calculation of quantities will be based on the 'authorised' dimensions, regardless of the actual dimensions to which the work has been constructed.

When the work is not constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, the Engineer may nevertheless, at his sole discretion, accept the work for payment. In such cases no payment shall be made for quantities of work or material in excess of those calculated for the 'authorised' dimensions, and where the actual dimensions are less than the 'authorised' dimensions minus the tolerance allowed, quantities for payment shall be calculated based on the actual dimensions as constructed."

PSA 7 TESTING

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Witness 2

Contractor

Witness 1

Witness 2

PSA 7.1 APPROVED LABORATORIES

REPLACE THE CONTENTS OF SUBCLAUSE 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 Engineer 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 Engineer;
- (c) Any testing laboratory established and operated on the Site by or on behalf of the Employer or the Engineer.
- (d) Any other laboratory that the Engineer approves in his absolute discretion."

PSA 8 MEASUREMENT AND PAYMENT

PSA 8.1 MEASUREMENT

PSA 8.1.1 Method of measurement, all sections of the Schedule

DELETE THE WORDS

"and South West Africa".

PSA 8.1.2 Preliminary and General item or section

PSA 8.1.2.1 Contents

REPLACE THE LAST SENTENCE OF SUBCLAUSE 8.1.2.1(B) WITH THE FOLLOWING:

"Separate items will be scheduled to cover the fixed, value-related and time-related components of the Contractor's preliminary and general costs."

PSA 8.1.2.2 Tendered sums

REPLACE THE CONTENTS OF THIS SUBCLAUSE 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 tendered sums under items 8.3 and 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

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facilities, workshops, ablutions, services such as water, electricity, Wastewater and rubbish disposal, access roads and all other facilities required, as well as for the maintenance and removal on completion of the works of these facilities and cleaning-up of the site of the Contractor's establishment and reinstatement to not less than its original condition, and

- providing the facilities for the Engineer and his staff as specified in the Contract and their removal from the site on completion of the Contract."

PSA 8.2 PAYMENT

PSA 8.2.1 Fixed-charge and value-related items

REPLACE THE CONTENTS OF SUBCLAUSE 8.2.1 WITH THE FOLLOWING:

PSA 8.2.1.1 Fixed-charge items

"Payment of fixed charges in respect of item 8.3.1 will be made as follows:

- EIGHTY PER CENT (80%) of the sum tendered will be paid when the facilities have been provided and approved;
- The remaining TWENTY PER CENT (20%) will be paid when the works have been completed, the facilities have been removed and the site of the Contractor's establishment has been cleared and cleaned to the satisfaction of the Engineer.

No adjustment will be made to the sum tendered in respect of item 8.3.1 should the value of the works finally executed or the time for completion vary in any way from that specified in the tender.

PSA 8.2.2 Time-related items

REPLACE THE CONTENTS OF SUBCLAUSE 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 tendered for the item by the tendered 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."

PSA 8.5 SUMS STATED PROVISIONALLY BY THE ENGINEER

REPLACE THE CONTENTS OF SUBCLAUSE 8.5 WITH THE FOLLOWING:

PSA 8.5.1 Works executed by the Contractor

Unit: Prov Sum

The Contractor will be reimbursed in substitution of the Provisional Sums (if any) allowed in the Schedule of Quantities for work to be executed by the Contractor, in the amounts determined in accordance with the provisions of Clause 6.6 (GCC 2015).

PSA 8.6 PRIME COST ITEMS

REPLACE SUBCLAUSE 8.6 WITH THE FOLLOWING:

PSA 8.6 PRIME COST SUMS

- Description of item to which Prime Cost Sum applies Unit: PC Sum
- Charge required by Contractor on sub-item (a) above Unit: %

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Sub-items (a) and (b) will be provided in the Schedule of Quantities for each different item to which a Prime Cost Sum applies.

The Contractor shall be reimbursed under sub-item(s) (a) in substitution of the respective Prime Cost Sums included in the Contract, the actual price(s) paid or payable by him in respect of the goods, materials or services supplied, but excluding any charges for the Contractor's labour, profit, carriage, establishment or other charges related to such goods, services or materials.

The Contractor shall be paid under sub-item (b), the respective percentage, as stated by the Contractor in his tender, of the amount certified by the Engineer for payment under the related sub-item (a). The percentages tendered by the Contractor for each respective sub-item (b) included in the Schedule of Quantities shall be deemed to be in full and final compensation to the Contractor in respect of any charge by the Contractor for labour, carriage profit, establishment and for any other charges related to the goods, services or materials supplied under the related sub-item (a).

If the Contractor shall have omitted within his tender to insert a tendered percentage under sub-item (b), or tendered a zero percentage, the Contractor's tendered rate for sub-item (b) shall be deemed to be zero and the Contractor shall not be entitled to any payment under sub-item (b).

Note in connection with additional tests required by the Engineer:

When a PC sum is included in the Schedule of Quantities for additional tests required by the Engineer, the Contractor shall be responsible for both the cost of normal testing as described in the Project Specifications and for the cost of any additional test that indicates that the specifications have not been complied with."

ADD THE FOLLOWING SUBCLAUSE:

PSA 8.10 COMPLIANCE WITH OHS ACT AND REGULATIONS (INCLUDING THE CONSTRUCTION REGULATIONS 2003) UNIT: SUM

The tendered sum shall always include full compensation to the Contractor for compliance with all the requirements of the OHS Act and Regulations (including the Construction Regulations 2003) for the full duration of the Contract. The successful tenderer shall provide the Engineer with a complete breakdown of this tendered sum.

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

Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2

PSAB: ENGINEER'S OFFICE

(Applicable to SANS 1200 AB)

PSAB 1 SCOPE

PSAB 1.1 Delete this sub-clause and substitute:

This Specification covers the requirements for office, storeroom, locker room, car ports, and the minimum associated facilities for the use of the Engineer on the site.

THE CONTRACTOR SHALL NOTE THAT THESE ARE GENERAL REQUIREMENTS AND THAT ONLY THOSE ITEMS THAT ARE SPECIFICALLY ITEMISED IN THE SCHEDULE OF QUANTITIES ARE REQUIRED ON THIS CONTRACT.

When the Contract is awarded, the Engineer shall give the Contractor full details in writing regarding the number, type, and layout of all the units required, as well as details of fittings and equipment required. The Contractor shall not order any buildings, material, equipment or fittings on the basis of what is specified or scheduled without written confirmation from the Engineer.

The offices, laboratory, storeroom, locker room and car ports shall, unless otherwise agreed or instructed, be erected near the Contractor's offices and laboratory and the entire area shall be fenced with security fencing and provided with a gate. The Contractor shall take all reasonable precautions to prevent unauthorised entry to the offices and laboratories and to ensure the general security of the offices.

PSAB 2 INTERPRETATIONS

PSAB 2.3 Definitions

Add the following definitions:

Store Room: A store room constructed on site, or a mobile, semi-mobile or prefabricated unit.

Locker Room: A locker room constructed on site, or a mobile, semi-mobile or prefabricated unit.

Car Port: A roofed shelter constructed on site for one or more cars as specified or scheduled.

PSAB 3 MATERIALS

PSAB 3.1 NAMEBOARDS

REPLACE THE FIRST SENTENCE OF SUBCLAUSE 3.1 OF SANS 1200 AB WITH THE FOLLOWING:

"The Contractor shall supply and erect at locations approved by the Engineer, the number of contract name boards as specified, which, unless otherwise specified in the Contract, shall comply with the recommendations for the standard board of the South African Association of Consulting Engineers with regard to size, painting, decorating and detail, and the requirements described hereunder."

PSAB 3.2 Office Building(s)

Delete this sub-clause entirely and retitle the sub-clause "FACILITIES FOR ENGINEER".

Add the following sub-clauses:

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Contractor

Witness 1

Witness 2

PSAB 3.2.1 Office Buildings

The Contractor shall provide, furnish, and equip one or more offices (as scheduled) for the use of the Engineer.

Furniture and equipment:

The office shall be equipped with the following:

- i) Office desk with a surface area of at least 1,5 m² and having at least 3 drawers, one of which can be locked.
- ii) General purpose steel cabinet with doors, lock and two keys with at least 1,5 m² shelf areas and a volume of 0,7 m³.
- iii) Two office chairs.
- iv) Sufficient racks and hangers for hanging contract drawings. The hangers shall be of the "Barhold" type, with one hanger to five drawings.
- v) Double 80-watt fluorescent light fittings complete with ballast and tubes (three per Type 1 office, and one per Type 2 office).
- vi) Drawing table with a smooth flat top having an area of at least 3m²

In addition to the above the office shall be equipped with the following:

- vii) Conference table large enough to accommodate twelve people and have a surface area of at least 4 m².
- viii) Ten office chairs.

PSAB 3.2.2 Air-Conditioning Units

Where required by the Engineer, the Contractor shall provide, install and maintain air-conditioning units.

The air-conditioning unit shall be an electricity operated compressor type with closed circuit, and not an evaporation type. The capacity of the air-conditioning units shall be at least 2,2 kW each.

On completion of the Works, ownership of the air-conditioning units shall revert to the Contractor who shall remove them from the Site.

PSAB 3.2.3 Special Testing of Materials

Except when specifically directed by the Engineer, the Contractor shall be responsible for the execution of all tests required for quality and compaction control and shall provide all necessary staff and equipment to the satisfaction of the Engineer for this purpose on the site of the works. No payment will be made for tests carried out by the Contractor except for specific tests ordered by the Engineer.

Over and above the normal check tests carried out by the Engineer on site the Engineer may from time to time order the Contractor to arrange special check tests to be carried out by an approved independent laboratory. Where such testing is contemplated in advance, allowance shall be made for the cost thereof by the inclusion of a Provisional Sum.

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Witness 2

Contractor

Witness 1

Witness 2

PSAB 3.2.4 Photocopying Machine

The Contractor shall arrange for the provision, installation and maintenance of an approved photocopying machine, capable of making up to A3-sized copies, within the Engineer's office. The price shall include for all accessories such as paper, etc. for making a maximum of 1 000 A4-sized copies per month.

Upon completion of the whole of the works, the ownership of the photocopying machine shall revert to the Contractor who shall remove it from the site.

PSAB 4 PLANT

ADD THE FOLLOWING SUBCLAUSE

“PSAB 4.2 SURVEY EQUIPMENT

The Contractor shall provide on-site and make available for the exclusive use of the Engineer and his staff, survey equipment.

All survey equipment provided by the Contractor shall be in good condition, properly calibrated and fit for the purpose.

In addition to survey equipment provided by the Contractor for the exclusive use of the Engineer and his staff, the Contractor shall make available for use by the Engineer, the further survey equipment listed as agreed with the RE at all times when such is reasonably required by the Engineer and his staff for the purposes of the Contract.”

PSAB 5 CONSTRUCTION

ADD THE FOLLOWING SUBCLAUSE

“PSAB 5.6 SURVEY EQUIPMENT

All survey equipment provided by the Contractor shall be always kept fully serviceable by the Contractor. The Contractor shall have any defective equipment repaired or replaced at his own cost within 12 hours after notification by the Engineer's staff.

Where required by the Engineer, the Contractor shall, at his own cost, promptly arrange for the recalibration of survey equipment provided.”

Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2

PSC: SITE CLEARANCE

(Applicable to SANS 1200 C)

PSC 3 MATERIALS

PSC 3.1 DISPOSAL OF MATERIAL

ADD THE FOLLOWING:

"The Contractor shall obtain his own licensed dumping sites for the disposal of material and all transport costs shall be included in the rates for earthworks and site clearance, including the items listed under SANS 1200D, DB and LB."

PSC 5 CONSTRUCTION

PSC 5.1 AREAS TO BE CLEARED AND GRUBBED

ADD THE FOLLOWING:

"The Engineer shall clearly indicate on site or on drawings which area has to be cleared, which existing structures are to be demolished and the rubble removed, and which existing pipelines are to be protected."

PSC 5.2 CUTTING OF TREES

PSC 5.2.3 Preservation of trees

PSC 5.2.3.2 Individual trees

REPLACE THE LAST SENTENCE WITH THE FOLLOWING:

"An amount of R 1000.00 will be deducted from moneys due to the Contractor as a penalty for every tree that is damaged or removed unnecessarily."

PSC 5.5 RECLEARING OF VEGETATION

ADD THE FOLLOWING:

"When areas have to be re-cleared on the written instructions of the Engineer, 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 8 MEASUREMENT AND PAYMENT

PSC 8.2 PAYMENT

PSC 8.2.8 Demolish and removal of existing structures

This shall be scheduled in the Schedule of Quantities as separate items.

ADD THE FOLLOWING:

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Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

"PSC 8.2.11"Take down and re-erect existing fencesUnit: m

The rate shall cover the cost of taking down the fence referred to , stacking and guarding all materials, the cost of loading, transporting and off-loading such materials, the cost of re-erecting the fence in its revised position using the dismantled material, the cost of temporary bracing of the fencing sections not taken down and the cost of appurtenant materials that may be required to restore the fence to its original condition before dismantling.

PSC 8.2.12Moving and stacking of existing pipes and equipmentUnit: Sum

Where appropriate pipes and other equipment as listed must be loaded (without damaging the material) and stacked at approved locations (by the Engineer). The stacking of the pipes and storing of equipment must be done according to the manufacturer’s requirements or as per the method statement provided by the contractor and approved by the engineer. The stacking area must be prepared by clearing of vegetation and compaction of the in-situ material (to 90% Mod AASHTO density).

The rate shall cover the cost of loading, transporting and stacking of the materials, preparation of the stacking area and fencing of the stacking area as well as adherence to the Health and Safety specifications.”

EmployerWitness 1Witness 2ContractorWitness 1Witness 2

PSD: EARTHWORKS

(Applicable to SANS 1200 D)

PSD 3 MATERIALS

PSD 3.1 **Classification for Excavation Purposes**

PSD 3.1.1 Method of Classifying

After the first paragraph add:

Inspection of the material for any classification other than soft excavation shall be undertaken by the Engineer prior to any excavation. Levels of the occurrence of intermediate and hard rock excavation shall be measured and agreed, recorded and signed by both the Engineer and the Contractor before commencement of intermediate or hard rock excavation.

PSD 3.1.2 Classes of Excavation

Add the following:

Notwithstanding the provisions of this sub-clause of anything to the contrary in these Specifications or the Schedule of Quantities, Boulder Excavation Class A and Class B shall be classified as Intermediate Material, with the proviso that boulders requiring drilling and blasting in order to be removed or loaded as specified in Sub-Clauses 3.1.2(a)(1) and (2) will be measured separately as Hard Rock Excavation.

PSD 3.2 **CLASSIFICATION FOR PLACING PURPOSES**

PSD 3.2.2 **Material Suitable for Replacing Over break in Excavations for Foundations.**

ADD THE FOLLOWING:

"Where over break occurs under foundations or other elements placed on the ground it shall be replaced with mass concrete class 15 MPa/19mm. Replacing over break will be done at the Contractor's expense."

PSD 3.3.2 **Backfilling and Embankments**

Delete this sub-clause and replace with the following:

"Sufficient material arising from excavations for structures, terraces, foundations etc. and which is suitable for backfilling round and beneath structures, footings etc., embankments and the like, shall be stockpiled in the vicinity of its destination or point of use. The Contractor shall ensure that the site(s) selected for such stockpiling are well clear of all works to be constructed and that such siting will not hamper construction activities.

All surplus material suitable for backfilling and embankments and all material which the Engineer considers to be unsuitable for backfilling and embankments shall be disposed of as directed by the engineer.

Tenderers shall therefore allow in their prices for all temporary stockpiling and double handling arising from this requirement.

The Contractor shall be entirely responsible for deciding whether or not excavated material suitable for backfilling is surplus to that required for the full construction and reinstatement of the Works. Should it become necessary to reclaim material previously disposed of or to import additional material from spoil dumps as a result of the Contractor's failure to comply with the above requirement for any reason whatever, then the Contractor shall bear all additional costs connected with such reclamation and/or importation.

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Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

PSD 4 PLANT

PSD 4.4 DETECTORS

REPLACE THE CONTENTS OF SUBCLAUSE 4.4 WITH THE FOLLOWING:

"The Contractor shall, for the purposes of detecting and locating underground services in accordance with the provisions of sub-clause 5.4 of SANS 1200 A and sub-clause 5.1.2 of SANS 1200 D, at his own cost, provide and use detecting equipment which is suitable for the detection of underground cables and pipes."

PSD 5 CONSTRUCTION

PSD 5.1 PRECAUTIONS

PSD 5.1.1 Safety

PSD 5.1.1.1 Barricading and lighting

REPLACE:

"Machinery and Occupational Safety Act, 1983 (Act 6 of 1983)" WITH "Mine Health and Safety Act, 1993 (Act No 29 of 1996) as amended".

Delete the Sub-Clause and substitute:

Without diminishing any obligation which the Contractor may have in terms of any Act, Ordinance or other legislation, the Contractor shall ensure that all excavations which are accessible to the public or which are adjacent to a public road or thoroughfare, or by which the safety of persons may be endangered are protected as set out in Clause 13 of the General Safety Regulations of the Occupational Health and Safety Act, 1993 and that watchmen are employed to ensure that barricades, barriers and lights are effective at all times.

Trench excavations shall be protected by means of at least three horizontal strands of 2,50 mm diameter galvanised wire. Double sided "red/white" chevron tapes shall be tied to the wires in a zigzag vertical pattern at maximum spacing of 1 m. The wires shall be stretched tightly between supports along both sides and ends of the excavation. The supports shall consist of poles or iron standards securely planted in solid ground at not more than 5 m centres to enclose the spoil and the excavations.

Bridges for vehicles and / or pedestrians shall be provided along the route of the work as and where may be considered necessary by the Engineer. They shall consist of a number of suitably sized steel plates laid across open excavated trenches. They shall be protected on each side by a stout two rail timber fence, at least 1 m high, consisting of 150 mm x 75 mm timber verticals set firmly into the ground, with 75 mm x 50 mm rails securely fastened to them. At least 4 lamps or reflective markers must be provided at each crossing.

Where construction is in, or across, public roads the barricades or barriers and temporary road signs shall be erected to comply with the requirements set out in Road Note 13 read in conjunction with the SA Road Traffic Signs Manual.

PSD 5.1.1.2 Safeguarding of excavations

REPLACE:

"Machinery and Occupational Safety Act" WITH " Mine Health and Safety Act, 1993 (Act No 29 of 1996) as amended)".

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Employer

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Witness 1

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Witness 2

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Contractor

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Witness 1

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Witness 2

Delete the first three lines and substitute the following:

The Contractor or his agent or representative appointed in writing shall be deemed to be and shall be both the "employer" and "a person who is competent to pronounce on the safety" of all bracing and shoring as set out in Regulation 13 (Demolition and Excavation) of the General Safety Regulations of the Occupational Health and Safety Act, No 85 of 1993.

PSD 5.1.2 Existing services

PSD 5.1.2.2 Detection, location and exposure

REPLACE THE CONTENTS OF SUBCLAUSE 5.1.2.2 WITH THE FOLLOWING:

"The exposure by the Contractor of underground services, as required in terms of sub-clause 5.4 of SANS 1200 A (as amended) shall be carried out by careful hand excavation at such positions and to such dimensions as are agreed to by the Engineer.

Unless otherwise instructed or agreed by the Engineer, no service shall be left exposed after its exact position has been determined and all excavations carried out for the purposes of exposing underground services shall be promptly backfilled and compacted to the following densities:

- (a) In roadways: 93% Mod AASHTO density; and
- (b) In all other areas: 90% Mod AASHTO density.

Where hand excavations to expose underground services must be carried out in roadways, the Contractor shall reinstate the road layer works in accordance with the provisions of sub-clause 5.9 of SANS 1200 DB.

Payment in respect of exposing the services by means of hand excavation as described above, will be made in accordance with sub-clause PSD 8.3.8.1 c.

Payment in respect of reinstating layer works in roadways will be made in accordance with sub-clause 8.3.6.1 of SANS 1200 DB (as amended)."

PSD 5.1.2.3 Protection of cables

REPLACE SUBCLAUSE 5.1.2.3 WITH THE FOLLOWING:

PSD 5.1.2.3 Protection of cables during construction

Further to the requirements of sub-clause 5.4.2 of SANS 1200 A (as amended), major excavating equipment and other plant shall not be operated dangerously close to known services. Where necessary, excavation near known services shall be carefully carried out with suitable hand tools, excluding picks wherever their use could damage the services. No additional payment will apply to such more difficult work.

Should any service not being a known service be discovered or encountered during the course of the Contract, the Contractor shall, in addition to complying with the requirements of subclause 5.4.2 of SANS 1200 A (as amended), immediately notify the Engineer thereof and implement such measures as will prevent damage of such service or, if it was damaged in the course of discovery, will prevent and minimise the occurrence of any further damage occurring.

PSD 5.1.3 Storm water and groundwater

The second paragraph of sub-clause 5.1.3 shall be deleted and replaced with the following:

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"The Contractor shall take every precaution to prevent water from any source entering excavations. The Engineer may order additional precautions to be taken where he is not satisfied with the Contractor's arrangements. Any water, including seepage, entering excavations shall be removed immediately by the Contractor".

Where the bottoms or sides of excavations in which bases are to be cast deteriorates or are softened on account of negligence on the part of the Contractor in allowing storm or other water to enter the excavations, the softened material shall be removed and replaced with foundation fill as described in Sub-clause PSD 5.2.2.1 as directed by the Engineer, at the Contractor's expense.

PSD 5.2 METHODS AND PROCEDURES

PSD 5.2.2 Excavation

PSD 5.2.2.1 Excavation for general earthworks and for structures

REPLACE THE FIRST SENTENCE OF PARAGRAPH (e) WITH THE FOLLOWING:

"Where excavations have been carried 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. This will be done at the expense of the Contractor.

Where excavations for structures have been carried out in hard material, the Engineer may direct that over-excavation be backfilled with weak concrete if there is a danger of settlement or differential settlement of the foundations.

Where the sides of excavations against which concrete is to be cast have been over-excavated or have collapsed partially, the Contractor shall re-trim the excavations if necessary and, unless other remedial measures are agreed to by the Engineer, shall cast the concrete for the structure, including the additional concrete that may be required as a result of the over-excavation or partial collapse. The cost of the additional concrete or remedial measures shall be for the Contractor's account."

PSD 5.2.5 Transport for Earthworks

PSD 5.2.5.1 Free haul

DELETE THE CONTENTS OF THIS CLAUSE AND REPLACE IT WITH THE FOLLOWING:

"The free haul distance for the project is 2km."

PSD 8 MEASUREMENT AND PAYMENT

PSD 8.3 SCHEDULED ITEMS

PSD 8.3.8 Existing Services

PSD 8.3.8.1 Location

REPLACE ITEM 8.3.8.1 WITH THE FOLLOWING:

"8.3.8.1 Hand excavation for locating and exposing existing services: **Unit: m³**

The unit of measurement shall be the cubic metre of material excavated, measured in place according to the authorised or actual dimensions of the excavation, whichever is the lesser.

Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2

The tendered rates shall cover the cost of excavating in all materials by means of hand tools within authorised dimensions and at locations approved by the Engineer in accordance with the requirements of sub-clause PSA 5.4.1 for all precautionary measures necessary to protect the services from damage during excavation and backfilling, and for subsequent backfilling and compacting. Compaction of material in all areas shall be to 93% of the modified AASHTO density.

The tendered rates shall also include for keeping excavations safe, for dealing with surface and subsurface water, for removing surplus excavated material from the site, for transporting all material within the free-haul distance, and for supplying adequate supervision during both excavation and backfilling operations."

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

PSDB: EARTHWORKS (PIPE TRENCHES)

(Applicable to SANS 1200 DB)

PSDB 3 MATERIALS

PSDB 3.7 Selection

REPLACE THE WORDS

"if he so wishes"

IN THE FIRST LINE OF THE SECOND PARAGRAPH WITH THE WORDS

"at his own cost".

PSDB 5 CONSTRUCTION

PSDB 5.1 PRECAUTIONS

PSDB 5.1.2 Storm water, Seepage and Dewatering of Excavations

PSDB 5.1.2.2 Special Water Hazards

Add the following:

No specific items will be scheduled for special water hazards; the Contractor shall include for dealing with all water in his tendered rates for earthworks. Refer Clause PSA 5.5 of the Project Specifications.

PSDB 5.1.2.3 Sloping Ground

Delete the Sub-Clause and substitute:

The Contractor shall be responsible throughout the duration of the Contract, inclusive of the Defects Liability Period, for the provision of all soil erosion preventative measures necessary to protect the trenches, pipeline(s) and land used by the Contractor during the Contract from any adverse effects of soil erosion, settlement, scour, etc., resulting from the construction of the Works.

Cross embankments, generally extending across the full width of the working strip, consisting of low earth mounds shaped to rounded form and so oriented as to have a fall of 1% along their length, shall be constructed with compacted material having a minimum density of 90% modified AASHTO density and minimum dimensions and maximum spacings dependent on the slope of the ground along the length of the pipeline, as indicated in the following table:

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Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

Slope of Ground	Minimum Height	Minimum Base Width	Maximum Spacing
0% - 2%	No cross-embankments required		
2% - 5%	300 mm	1,2 m	55 m
5% - 10%	300 mm	1,2 m	40 m
10% - 15%	375 mm	1,5 m	30 m
Greater than 15%	450 mm	1,7 m	20 m

The top width of all cross-embankments shall be at least 300 mm.

The height of the cross-embankments for a distance of 1 metre on either side of the trench centreline shall be raised 150 mm above the remainder of the cross-embankment to allow for settlement. To form a satisfactory drainage channel upstream of each cross-embankment (at a slope of 1%) the crown over the backfilled trench shall be removed for 0,5 m upstream of the cross-embankment.

Cross-embankments shall be constructed to the same minimum standards and dimensions indicated above wherever artificial slopes have been formed on the working strip or other areas used during construction and, with the approval of the Engineer, are permitted to be so left.

Payment will be made for the construction of cross-embankments in accordance with Sub-Clause 8.3.4(c), provided construction thereof has been either ordered or approved by the Engineer prior to the commencement of such construction.

PSDB 5.1.2.4 Cross Walls in Trenches

Add new Sub-Clause:

The Engineer may order the Contractor to construct cross walls in trenches to minimise the danger of flooding. Such cross walls shall be constructed to details given by the Engineer. Measurement and payment for construction of cross walls ordered will be on a rate basis where so scheduled or alternatively on a day work basis.

ADD THE FOLLOWING NEW SUBCLAUSES TO SUBCLAUSE 5.1:

PSDB-5.1.5 Removal of existing pipelines

Where existing pipes must be removed, they shall be carefully opened by machine excavation to 300 mm above the pipes after which the whole pipe shall be fully exposed by means of hand excavation. The excavation width shall comply with sub-clause 8.2.3.

The pipes shall be removed from the trench in a manner approved by the Engineer and brought to the surface for inspection by the Engineer.

Pipes that are declared suitable for reuse and pipes declared unfit for reuse shall be dealt with in an applicable manner described in the specifications, or on the Drawings or on the Engineer's instructions, as relevant."

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Witness 2

Contractor

Witness 1

Witness 2

PSDB 5.1.6 Maximum length of open trench

The Contractor shall plan his operations in such a manner that the length of trench excavation remaining open shall be restricted to the absolute minimum. No excavation for prefabricated culverts may be commenced until the pipes or culverts to be installed are on site, and the excavations shall be backfilled within seven days of the pipes being installed. Unless otherwise permitted by the Engineer in writing the total length of open trench shall not exceed three hundred (300) metres.

Regardless of any approval or permission granted by the Engineer, the Contractor shall comply with any restrictions on length of trench contained in his insurance policy. All manholes, catch pits, kerb inlets, etc., shall be completed and backfilled at the same time as the installation of the prefabricated culverts.”

PSDB 5.5 TRENCH BOTTOM

EXTEND THE SUB-CLAUSE TO INCLUDE THE FOLLOWING:

- “(a) On completion of excavation, before the bottom is trimmed or bedding is placed, the bottom of the trench in suitable material shall be so compacted that the density of the upper 100mm thick layer of material is 90% of modified AASHTO density.
- (b) Should the nature of the material be such that the specified density cannot be achieved the bottom of the trench shall be over-excavated, the bottom of the over-excavation compacted, and the excavated material replaced and compacted; the depths of over-excavation, which shall be agreed with the Engineer, shall be such that the specified density is attained at the bottom of the trench.
- (c) Where, in the opinion of the Engineer, the trench bottom is unacceptably wet or unstable due to the presence of ground water (but not due to negligence on the part of the Contractor) the Engineer will order the Contractor to over-excavate the trench and refill with 19mm stone complying with the relevant requirements of SANS 1083.”

PSDB 5.6 BACKFILLING

PSDB 5.6.3 Disposal of soft excavated material

Surplus and unsuitable material shall be disposed of in designated spoil areas or utilised as fill, as directed by the Engineer.

PSDB 5.6.8 Transport for earthworks for pipe trenches.

REPLACE THE CLAUSE WITH THE FOLLOWING:

“All material obtained from the trench, from the site or from the borrow pits for use as backfill or bedding, will be considered to be transported within the free haul distances, irrespective of the distance hauled, as well as any spoil of hard material to an approved spoil site.

PSDB 8 MEASUREMENT AND PAYMENT

PSDB 8.3 SCHEDULED ITEMS

PSDB-8.3.2 Excavate in all materials for trenches, backfill, compact and dispose of surplus material (Clause 8.3.2(a))

ADD THE FOLLOWING CLAUSES:

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Witness 2

Contractor

Witness 1

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The attention of the Tenderer is drawn to clauses 5.2, 8.1 and 8.2 of SANS 1200DB in relation to the basic principles of quantity calculation and measurement and payment for excavation, backfilling and compaction in the pipe trenches.

The unit of measurement shall be the volume (m³) of material excavated, backfilled and compacted (inclusive of surplus disposal), measured on the neat lines of the drawings, as specified in SANS 1200DB clauses 5.2, 8.1 and 8.2.

The rate for this item shall include all costs for lateral support. Lateral support will not be measured and paid separately for this Contract. The Tendered rate shall make allowances for any deviation in the total volume of excavated and compacted material resulting from the trench profile produced using the Tenderer's proposed method of construction, as compared to that illustrated on the drawings.

PSDB 8.3.3 Excavation ancillaries

ADD THE FOLLOWING SUBCLAUSE:

“PSDB 8.3.3.5 Backfill of Existing Trenches

Backfill of Existing Trenches **Unit: m³**

The existing trenches along the pipe route must be backfilled with the excavated material located alongside these trenches to 93% Mod AASHTO Density. The rate shall include for clearing foreign material (rubbish) from the stockpiled material, cleaning of the existing trenches, placing and compaction of the material in 150mm layer in the trenches.”

PSDB 8.3.4 Particular Items

PSDB 8.3.4.a Shore trench opposite structure or service

ADD THE FOLLOWING:

“It will be the Contractor's responsibility to ensure the safety and stability of the trenches. Payment for shoring on the rest of the pipeline, should it be necessary, shall be deemed to be included in the rates tendered for trench excavation.”

Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2

PSDM : EARTHWORKS (ROADS, SUBGRADE)
(Applicable to SANS 1200 DM)

PSDM 3 MATERIALS

PSDM 3.2 Classification for Placing Purposes

PSDM 3.2.3 Selected Layer

Add the following to paragraph (d): "or 3 x GM + 10 as approved.:

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".

Add the following:

Separate items will be scheduled for fill in the road prism, fill on spoil areas and fill on site (where a minimum density for such spoil material is required by the Engineer) and fill from the road prism, fill from the site and fill from commercial sources.

The rate for fill from commercial sources shall, in addition to the requirements of DM 8.3.4, cover the cost of the location of the source, complying with all the applicable precaution as set out in DM5.1, obtaining the material, selection and transport from the source to the point on the road where it is to be used.

(for hand excavation see SANS 1200D)

PSDM 8.3.5 SELECTED LAYER COMPACTED TO 93% OF MOD AASHTO MAXIMUM DENSITY

Unit: m³

Substitute "93 % MOD AASHTO density" in the heading of DM 8.3.5 with "% MOD AASHTO density as separately scheduled and specified"

Add the following:

Separate items will be scheduled for lower and upper selected layers as well as for material from the site of works and from commercial sources. The rate for selected layers from commercial sources shall, in addition to the provisions of DM 8.3.5, allow for locating the source, complying with all the applicable precautions as set out in DM 5.1, obtaining the material, selection and transport from the source to the point on the road where it is going to be used. No payment shall be made for the removal and replacement of unsuitable imported material.

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Witness 1

Witness 2

Contractor

Witness 1

Witness 2

PSG: CONCRETE (STRUCTURAL)

(Applicable to SANS 1200 G)

PSG 2 EXPLANATION OF TERMS

PSG 2.4.3 Joints

Delete the fourth sentence and substitute:

The Engineer may order further joints prior to the commencement of casting the relevant concrete wherein they are to be situated. Such joints will become "designated joints" and will be paid for in terms of Sub-Clause 8.5, or as may be otherwise agreed. However, should the Contractor require further joints to suit his own purposes he shall first obtain the approval of the Engineer. Such further joints may then be constructed but these will neither be "designated joints" nor will they be paid for.

PSG 3 MATERIALS

PSG 3.2 CEMENT

ADD THE FOLLOWING:

"Where reference is made in this specification or the standard specifications to the cement specifications, e.g., SANS 471: Portland cement and rapid hardening Portland cement, it shall be replaced with the new specification: SANS ENV 197-1 "Cement composition, specifications and conformity criteria Part 1: Common cements."

PSG 3.2.2 Alternative types of cement

REPLACE THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"Only CEM I 42,5 (Portland cement) or CEM II/A-V 42,5 (Portland fly ash cement) according to (SANS 50197-1), may be used. The cement may not consist of more than 20% siliceous fly ash blended with the OPC (Ordinary Portland Cement). Should the Contractor wish to use any other type of cement, he shall obtain the Engineer's prior written approval."

PSG 3.2.3 Storage of cement

ADD THE FOLLOWING:

"Cement shall not be stored for longer than 12 weeks without the Engineer's permission."

PSG 3.4 AGGREGATES

PSG 3.4.3 Storage of aggregates

ADD THE FOLLOWING:

"When aggregates of different chloride content are stored on the site, their use in the various classes of concrete shall be strictly controlled."

ADD THE FOLLOWING SUB-SUBCLAUSE:

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Contractor

Witness 1

Witness 2

PSG 3.4.4 Aggregate of dolomitic origin

"Aggregates for structural concrete shall be of dolomitic origin. The quantity of insoluble matter in respect of concrete made with aggregates of dolomitic origin, determined according to the method described in SANS 677, Appendix C, shall not be more than 15%"

PSG-3.5.1 Approval of admixtures required

No admixtures or aeration agents may be used without the prior written approval of the Engineer. Admixtures which have a retarding effect on the rate of hydration of the cement may not be used when the concrete temperature is below 20°C. A retarding admixture shall be used if temperatures of concrete mixes using cements of strength class 42.5R or 42.5 are between 20 to 30 °C or where the ambient temperature is between 20 to 30 °C."

PSG 4 PLANT

PSG 4.5 FORMWORK

PSG 4.5.1 Design

ADD THE FOLLOWING:

"All formwork or scaffolding required for any part of the Works shall be designed by the Contractor, and before commencing with the erection of any formwork or scaffolding, the Contractor shall submit the methods he proposes to use to the Engineer for approval. The Engineer has the authority to order alterations to the design or the sizes of any part of the formwork or scaffolding. The Contractor shall check the safety and suitability of all such alterations. The fact that the Engineer has approved or altered any part of the formwork or scaffolding shall not be construed as relieving the Contractor of his responsibility with regard to the strength and stability of the formwork or scaffolding."

PSG 4.5.2 Finish

CHANGE THIS SUB-CLAUSE AS FOLLOWS:

The quality of finish on the final concrete surfaces shall be as follows:

- (a) All visible concrete and up to 150 mm beneath ground level:.....Smooth
- (b) All concrete covered by soil:.....Rough

PSG 4.5.3 Ties

ADD THE FOLLOWING:

"No plugs, bolts, ties or clamps of any description used to hold the formwork will be allowed to project into or through the concrete unless expressly approved by the Engineer.

Only approved tie-rods consisting of solid rods (that remain embedded in the concrete) and with removable ends shall be used to hold the formwork of the walls. The removable tie-rod ends shall facilitate removal without damage to the concrete, and no permanently embedded parts of such tie-rods shall have less than 50 mm of cover to the finished concrete surface.

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Witness 2

Contractor

Witness 1

Witness 2

The cavities left in the concrete when the tie-rod end cones are removed shall be soundly caulked with a cement mortar to which an approved shrinkage-reducing agent has been added and shall be neatly finished to a smooth surface uniform with that of the surrounding concrete.

The cost of supplying special tie-rods as well as the filling of cavities left by the tie-rod cones shall be included in the rates tendered for formwork under the appropriate pay items.

On no account shall formwork be secured to reinforcing bars."

PSG 5 **CONSTRUCTION**

PSG 5.1 **REINFORCEMENT**

PSG 5.1.2 **Fixing**

ADD THE FOLLOWING:

"The Engineer will inspect the reinforcing after it has been fixed in place, the formwork has been cleaned, cover blocks have been positioned, and before concreting commences.

Should the reinforcement be supported by the joint filler, the filler shall be covered with a hard surface on the side to be concreted. The hard surface shall be sufficiently resilient to ensure that the joint and surfaces will be without defects.

Welding of reinforcing steel will not be permitted."

Fixing blocks for the attachment of fixtures may be embedded in concrete provided that the strength or any other desirable feature (such as appearance of the member) is not, in the opinion of the Engineer, impaired thereby.

Where mortar blocks are used, they shall be properly shaped so as not to slip out of position and shall be made of the same mix as the mortar of the concrete in which they are to be placed and they shall be cured in water for at least 7 days. The mortar shall be well compacted by approved means into the moulds to result in blocks with a density of at least 2 300 kg/m³ and which are free from honeycombing. Mortar blocks which have not been manufactured and cured strictly in accordance with these requirements or which are in any other way considered unsatisfactory by the Engineer, shall be rejected and shall be removed from the Site.

PSG 5.1.3 **Cover**

ADD THE FOLLOWING:

"The distance between pipes in the concrete and the reinforcing steel shall nowhere be less than

(a) 50 mm

PSG 5.2 **FORMWORK**

PSG 5.2.1 **Classification of finishes**

(c) Special

ADD THE FOLLOWING:

"This finish is obtained by first giving the surface a smooth finish with the joints between formwork panels forming an approved regular pattern suitable for the appearance of the structure. All projections shall then be removed,

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Witness 1

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irregularities repaired, and the surface rubbed or otherwise treated until it is smooth with an even texture, appearance and colour.

If the finish of exposed surfaces does not comply with the requirements for uniformity of the texture and appearance, the Contractor shall, when instructed to do so by the Engineer, rub down the exposed surfaces of the entire structure or any part thereof as specified below, entirely at his own cost. All repairs must be completed before the rubbing commences.

The surface shall be saturated with water for at least one hour. The initial rubbing of the face shall be carried out with a medium coarse carborundum stone together with a small amount of mortar of the same cement/sand ratio as the concrete being repaired. Rubbing shall continue until all form marks, projections and irregularities have been removed and a uniform surface has been obtained. The paste produced by the rubbing shall be kept in place. The final rubbing shall be carried out with a fine carborundum stone and water. This rubbing shall continue until the entire surface has a smooth, even texture and is uniform in colour. The surface shall subsequently be washed with a brush to remove surplus paste and powder."

All internal and external corners in concrete works shall have 20 x 20mm fillets and chamfers unless shown otherwise on the drawings. The unit rate bided for formwork shall cover the cost of forming these chamfers and fillets.

PSG 5.2.2 Preparation for formwork

ADD THE FOLLOWING:

"Construction joints shall be positioned as shown on the Drawings."

PSG 5.2.5 Removal of formwork

ADD THE FOLLOWING SUBCLAUSE:

"PSG 5.2.5.6 The Contractor shall make provision for the continued support of beams and slabs while the formwork is being removed and/or for back propping of beams and slabs."

PSG 5.3 HOLES, CHASES AND FIXING BLOCKS

ADD THE FOLLOWING:

"Cover blocks for reinforcing and fixtures may be placed into the concrete provided that neither the strength nor any other desirable characteristic (such as the appearance) of the concrete section is affected or impaired in the opinion of the Engineer.

The holes or cavities left by ferrule heads in the concrete shall be filled with an approved non-shrink grout applied strictly in accordance with the manufacturer's specifications."

PSG 5.4 PIPES AND CONDUITS

ADD THE FOLLOWING:

Openings for pipes shall be left in concrete members when so directed by the Engineer or when shown on the Drawings. Pipes shall be installed in such openings according to the details shown on the Drawings.

If water tightness is a requirement where pipes are cast into walls, floors and slabs, the Contractor shall ensure water tightness where smooth-surfaced pipes are used by using an approved method such as tape wrapping the pipes prior to casting in. The cost of such method will be deemed to be included in the rates."

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PSG 5.5 CONCRETE

PSG 5.5.1 Quality

PSG 5.5.1.5 Durability

The exposure conditions of the concrete are classified as "moderate - severe ".

PSG 5.5.1.7 Strength concrete

"The concrete mixes shall be designed by the Portland Cement Institute or a similar approved laboratory.

Unless otherwise specified on the drawings or in the Schedule, all structural concrete shall have a strength of 30 Mpa.

The concrete to be used on this contract shall be as follows:

- a) For water retaining structures, 35/19 MPa with a minimum cement content of 360kg/m³ and a maximum of 400kg/m³.
- b) For structures not in contact with water, 30/19 MPa concrete with a maximum cement content of 400kg/m³.
- c) For anchor blocks, benching and mass concrete, 15/19 MPa concrete.
- d) For no-fines concrete 15/19 Mpa concrete.

The successful Bidder will be required to submit samples of the fine coarse aggregate which he proposes using, to the Portland Cement institute (or equivalent approved laboratory) for tests regarding the suitability of such aggregates. The institutes shall prepare trial mixes of the two stronger grades of concrete required for the contract to establish acceptable design mixes.

These mixes shall be designed for vibration. All data reports prepared by the institute shall be submitted to the engineer for information and approval.

ADDITIONAL CLAUSE AFTER 5.5.1.7

Bleeding

The concrete shall be proportioned with suitable materials so that total bleeding does not exceed 0,3mm/cm² as measured by ASTM C232-92."

PSG 5.5.3 Mixing

PSG 5.5.3.2 Ready-mixed concrete

ADD THE FOLLOWING:

"Ready-mixed concrete may be used on the Site. The Contractor shall take samples for testing from every load delivered to the Site."

PSG 5.5.5 Placing

ADD THE FOLLOWING:

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Witness 1

Witness 2

Contractor

Witness 1

Witness 2

"Concreting of the wall between horizontal construction joints shall be carried out in both directions from a point on the wall in order to close the gap with fresh concrete."

Add new Sub-Clause:

In the case of continuous walls, these are to be cast in lifts of such height that each lift can be poured uninterruptedly in one continuous operation over the entire perimeter of the wall. No vertical or inclined construction joints of any kind will be permitted in continuous walls unless they have been specifically ordered or authorised by the Engineer. The placing of concrete shall commence at a convenient point on the perimeter of the wall and shall proceed both ways simultaneously so that fresh concrete meets fresh concrete. The Contractor may be required to work shifts to make the operation continuous.

PSG-5.5.6 Compaction

CHANGE THIS SUB-CLAUSE AS FOLLOWS:

PSG-5.5.6.3 Only mechanical vibrations will be allowed for compaction unless the Engineer approves in writing any other method."

PSG 5.5.7 Construction joints General

ADD THE FOLLOWING:

"No construction joints other than those indicated on the drawings will be permitted without the written approval of the Engineer. In all cases the proposed method of forming the joint shall be discussed and agreed with the Engineer.

Joints between tank bottoms, floors or wall bases and the walls and columns standing on them, shall not be made flush with the supporting surface, but shall be made in the wall or the column 140mm above the base. The 140mm high "riser" shall be cast as an integral part of the bottom, floor, or base, i.e., the concrete in the riser shall be deposited at the same time as the concrete in the bottom, floor or base adjacent to it.

In cases where there is a fillet at the bottom of the wall or column, the construction joint shall be made 140mm above the fillet.

The Contractor should note that the details of the undesignated joints shall be identical to the designated joints shown on the drawings where the joint is in a similar situation and performs the same duty.

The Contractor shall further note that the position and the type (where no identical designated joints exist) of undesignated joints shall be subject to the Engineer's approval.

All joints other than expansion, contraction, or other movement joints, shall be treated as follows:

As soon as practical, but not before 15 hours after placing, the joint surface shall be prepared to receive fresh concrete.

This preparation, as specified in Sub-clause 5.5.7.3 (a) to (d) shall be such as to remove all laitance or inert and strengthless material which may have formed and the specified shipping and sand blasting shall be such as to produce a roughened surface all over.

Concrete surfaces, where concreting is interrupted, shall be protected from the sun as specified in Sub-clause 5.5.8 (d)."

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

PSG 5.5.7.3 Construction joints

No vertical construction joints other than those shown on the Drawings may be formed. Horizontal construction joints shall also be as per the Drawings.

All construction joints shall be as indicated on the Detail Drawings and be treated with a wet-to-dry epoxy resin concrete adhesive as approved by the Engineer.

During construction, all waterstops are to be properly cleaned before casting into concrete. Shuttering to be so manufactured to keep and support waterstops in their correct and final positions.

No nails are to be utilized and no holes are to be made through waterstops in supporting them. When concrete is placed adjacent to waterstops, care must be taken not to disturb the position of the waterstops.

Waterstops are to be provided in as long lengths as possible to minimize joints. All laps to be strictly to the manufacturer's requirements.

PSG 5.5.8 Curing and protection

ADD THE FOLLOWING TO SUB CLAUSE (e):

"Only water-based curing compounds shall be allowed. Concrete will not be paid for unless properly cured and proof of curing is continuously visible on site."

ADD THE FOLLOWING NEW SUB CLAUSE (f):

"Where curing by retention of formwork is used as the only method of curing the concrete, it must be left in place for the minimum period specified in clause 5.5.8 but in no instance shall it be less than 7 days. The materials used for formwork shall consider properties such as thermal insulation and moisture absorption when assessing the suitability of the material, to the approval of the Engineer.

If impermeable curing membranes are to be used as a curing method, they shall be installed at the same time as formwork is removed and no portion of a concrete surface may be left unprotected for a period in excess of 2 hours. If the surface is an unformed finish e.g. top of deck slab, then the surface must be protected immediately by appropriate methods approved by the Engineer after it is finished, without damage to that surface, since it is vulnerable to plastic shrinkage cracking due to high rates of evaporation while the concrete is still in a plastic state. Plastic shrinkage and settlement shall not be permitted on any of the structural elements since it compromises the durability of the concrete."

PSG-5.5.9 Adverse weather conditions

ADD A NEW SUB CLAUSE 5.5.9.4:

"The temperature of concrete delivered to site shall be within the range 10° C to 30° C. Concrete which has a temperature outside of this range shall not be placed in the structure.

The rate of hydration of the cement in the concrete shall be such that the concrete can be placed and properly compacted within 2 hours after the addition of water to the mix ingredients. The initial set of the concrete shall not be unduly delayed due to inappropriateness of admixtures or cement type, which could promote bleeding."

PSG 5.5.9.2 Hot Weather Concreting

Delete the first two sentences and substitute:

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Witness 2

Contractor

Witness 1

Witness 2

When concreting operations are being carried out at ambient temperatures in excess of 32°C, the Contractor shall apply the relevant recommendations for hot weather concreting set out in American Concrete Institute publication ACI 305R-77 "Recommended practice for hot weather concreting".

PSG 5.5.10.1 Concrete surfaces screeds

After placing and compacting, the concrete on a top (unformed) surface shall be struck off with a template to the designated grades and tamped with a tamping board to compact the surface thoroughly and to bring mortar to the surface, leaving the surface slightly ridged but generally at the required elevation. No mortar shall be added, and noticeable surface irregularities caused by the displacement of coarse aggregate shall be made good by re-screeding after the interfering aggregate has been removed or tamped.

PSG 5.5.10.2 Concrete surfaces finishes

Wood-floated finish

Where wood floating is specified or scheduled, the surface shall first be given a finish as specified in sub-clause 5.5.10.1 of SANS 1200 G and, after the concrete has hardened sufficiently, it shall be floated to a uniform surface free of 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. NOTE: A degree of Accuracy II is required for wood-floated surfaces.

Steel-floated finish

Where steel floating is specified or scheduled, the surface shall be treated as specified in wood-floated finish 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.

The surface of tank bottoms, floors and roof slabs, etc. shall be given a steel float finish in accordance with Sub-clause 5.5.10, to Degree II accuracy.

ADD THE FOLLOWING SUBCLAUSES:

PSG 5.5.12 Concrete in Wet Ground

Delete the Sub-Clause and substitute:

The Contractor shall be fully responsible for keeping excavation free from water whilst construction work is being carried out. The methods by which he proposes to achieve this shall be approved by the Engineer before being implemented. The cost of dewatering shall be included in the tendered rates for the construction work and no separate payment shall be made for such dewatering throughout the construction period.

PSG 5.5.13.4 Epoxy Grout (Epoxy mortar type only)

Add new Sub-Clause:

The manufacturer's instructions shall be observed when an epoxy grout is used.

PSG 5.5.16 Applied loads

"No crushed-stone covering, or any other loads shall be placed on roofs and / or slabs of structures where shown on drawings before the concrete has attained its design strength, unless approved supports are provided."

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

PSG 5.5.17**Pipes and conduits**

Openings for pipes shall be left in the concrete members when so directed by the Engineer or when shown on the Drawings. Pipes shall be installed in such openings according to the details shown on the Drawings. The cost of such method will be deemed to be included in the rates tendered for.

The clear space between pipes of any kind embedded in reinforcement concrete and reinforcement shall not at any point be less than:

- a) 40mm, or
- b) 5mm plus the maximum size of coarse aggregate, whichever is the greater.

Pipes and specials to be set in concrete as shown on the drawings and listed in the Schedule of Quantities shall have all surfaces in contact with the concrete freed from all coatings and thoroughly scraped and cleaned. The pipes shall be sitting firmly in position on line and level and have formwork fixed around them.

Where the pipe or special is supplied by others, the Contractor shall provide a box-out in the wall and cast the unit in at a later stage. When constructing such as box-outs, reinforcement shall not be cut, but shall run through the opening. Reinforcement shall be cut and/or bent out at a later stage to suite the items being cast in. After installation of the item the remaining reinforcement shall be bent back in position.

Where entry holes for pipes/specials have been provided in the walls, the Contractor shall be responsible for the concreting in of such pipes/specials regardless of whether or not these have been supplied by him.

Before commencing with the positioning in holes of any pipes/specials, the Civil Contractor shall:

- a) Remove all formwork and boxing remaining in the holes;
- b) Make any alterations required to the position and shape of the holes and cut reinforcement to suit the item, as directed by the Engineer; and
- c) Thoroughly scabble and cement slush the sides of the holes to obtain a satisfactory bond surface for the new concrete and treat the surface as specified in Sub-clause 5.5.7.

Immediately prior to concreting being carried out by the placing of mortar and concrete around the pipes, the surface of the existing concrete shall be saturated with water. All surplus water shall be removed, and the surface covered with a layer, approximately 12mm thick, of mortar made of the same mix as the concrete in which the pipe/specials are to be placed.

The concrete ingredients shall be mixed and placed as dry as possible to obtain a dense, waterproof concrete. The concrete shall be carefully worked around the puddle flange, if any, and the pipe barrel or body of the special, and shall be vibrated in layers so as to obviate a falling away from pipe/special surfaces of the concrete already placed.

The whole shall, when set, form a dense, homogeneous and waterproof mass.

PSG 5.5.18**Fixing of equipment**

- a) The Contractor will be responsible for the forming of pockets and grouting in of holding down bolts for equipment supplied under a separate contract. Holding down bolts will be supplied and positioned in the pockets by a Mechanical Contractor, unless otherwise specified by the Engineer.
- b) Upon completion of the positioning and alignment of equipment, the Contractor shall, in collaboration with the other Contractor, grout up pockets and base plates (subject to (c) below) necessary for the permanent installation of the equipment.
- c) Only after the Engineer is satisfied with the alignment and the level of each item of plant, shall the Contractor grout up the base plate with an approved non-shrink grout.

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Witness 1

Witness 2

Contractor

Witness 1

Witness 2

PSG 5.5.19 Soilcrete

Where Soilcrete is specified for filling under floor slabs, the Soilcrete shall comply with the requirements of sub clause 3.5(d) of section 1200 DB as amended and shall be placed as specified in the sub clause.

PSG-5.5.20 Plasterwork

Plasterwork shall consist of a single coat, comprising one application of a 1:6 cement: sand mixture with a wood float finish. The thickness of the plaster shall be between 13 and 20 mm. All plaster shall be finished smooth, shall be plumb and corners shall be rounded and square."

PSG-5.5.21 Grouting of machine and structural base plates

PSG 5.5.21.1 Formwork

Formwork for grouting shall comply with the applicable requirements of Sub-clause 5.2. 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 5.5.21.2 Mixing (all free-flowing grouts except epoxy grouts)

The grout shall be mixed to a homogenous 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 three minutes 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 that can be placed in a period of 20 minutes. After the grout has been mixed, it shall not be re-tempered by the addition of water.

PSG 5.5.21.3 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 compacted, will be free of air pockets and will be evenly distributed under 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 trapped 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 access grout on or about the bedplates shall be removed.

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

Damage to paintwork, if any, shall be repaired within 24 hours.

Packing plates, shims and other levelling devices, shall remain in position.

PSG 5.5.21.4 Dry-packed grout (standard dry sand and cement grout)

Dry-packed grout shall have a minimum compressive strength at 28 days of 20MPa. 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; and
- 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 5.5.21.5 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 50mm, a sand-based mix shall be used. Where the clearance exceeds 50mm, the Engineer may order a mix with a base of sand, plus pea gravel to be used.

PSG 5.5.21.6 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 25mm, a sand-based mix shall be used.

Where the clearance exceeds 25mm, the Engineer may order a mix with a base of sand plus pea gravel to be used.

Each batch shall be mixed for at least 6 minutes 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 3.13.2. Grout shall be placed within 45 minutes after the addition of the powdered aluminium.

The Contractor shall not use powdered aluminium additive when the ambient temperature is below 5°C.

PSG 5.5.21.7 Epoxy grout (epoxy mortar type only)

The manufacturer's instructions shall be observed when epoxy grout is used.

PSG 6 TOLERANCES

PSG 6.2 PERMISSIBLE DEVIATIONS

PSG 6.2.3 Specified permissible deviations

ADD THE FOLLOWING:

"Degree-of-accuracy II is applicable.

Every specified permissible deviation is binding in itself. The cumulative effect of permissible deviations will not be considered. The maximum permissible vertical deviation is subject to the other permissible deviations."

REPLACE SUBCLAUSE 6.2.3(D)(5) WITH THE FOLLOWING:

	Permissible deviation		
	Degree of accuracy		
	III	II	I
	mm	mm	mm
"Vertically, per metre of height subject to a maximum of	5 50	3 30	2 10

Add the following to the Sub-Clause:

The following permissible deviations and degrees of accuracy shall apply unless otherwise specified or shown on the drawings.

ACCURACY III

- i) Buried foundations of buildings and structures.
- ii) Encasement to underground pipes.

ACCURACY II

All other parts of the work except tops of walls and tops of weir walls

ACCURACY I

Tops of outer walls: ± 3 mm overall, but ± 1 mm over 3 m
Tops of Weir walls: ± 2 mm overall

PSG 7 TESTS

PSG 7.1 FACILITIES AND FREQUENCY OF SAMPLING

PSG 7.1.1 Facilities

ADD THE FOLLOWING:

"The Contractor shall provide sufficient storage capacity for the concrete cubes and shall test the cubes by means of an approved, calibrated cube testing press installed on Site in a manner approved by the Engineer or shall arrange to have them tested by an approved laboratory.

The cost of all testing, including the cost of sampling, storage and transport of samples shall be included in the rates tendered for concrete work."

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PSG 7.1.2 Frequency of Sampling

Add the following to this Sub-Clause:

At least three samples shall be taken from each concrete structure cast daily exceeding 10 m³ in volume. The samples shall be taken at the following intervals:

- i) At the start of concreting
- ii) Midway through concreting
- iii) At end of concreting

The Contractor shall take independent samples of each batch delivered to the Site of Works from central concrete production facilities and submit the test results for evaluation in terms of Sub clause 7.3.

PSG 7.2.3 Laboratory Testing

Add to the Sub-Clause:

The Contractor will be liable for all costs incurred in making structural concrete cubes and having these tested.

ADD THE FOLLOWING:

PSG 7.2.5 Grouting

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 1m² 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 also subject them to compression tests to determine whether the specified strength has been achieved.

PSG 7.2.6 Water tightness testing (Sub-clause 5.5.11)

Unless otherwise ordered by the Engineer, all water containing structures shall be tested for water tightness. Backfilling around structures which are to be tested shall be delayed until after the testing unless otherwise authorised by the Engineer. Each structure shall be cleaned out, then filled with clean water in four equal stages up to normal top water level. While filling is in progress, the structure shall be examined for leaks and if it is obvious that some appreciable leak has developed the test shall be terminated, repairs carried out and testing resumed.

As soon as the water surface is steady after filling, the water level shall be established by means of a hook gauge to be provided by the Contractor and recorded, and thereafter, will be measured and recorded by the Engineer each successive 24 hours or less, in relation to a fixed benchmark. The results will be graphed to establish the progressive rate of absorption and leakage.

Concurrently with this test the Contractor shall carry out an evaporation loss test by providing a steel tank 600 mm x 600 mm x 450 mm deep, filled with 300 mm of water, and accurately measuring the drop in water level during 24

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hours. This drop in water level shall be regarded as a measure of the evaporation loss and shall be used to calculate the probable evaporation loss in the structure being tested.

If the nett rate of loss of water at any stage exceeds 5 mm depth per 24 hours (plus an allowance for evaporation) at the end of three days in the case of the first three stages, and at the end of seven days in the case of the fourth stage, and there is no prospect, in the opinion of the Engineer, of the rate of water loss reducing to that required, he shall have the right to deem the water containing structure to be not watertight, and to notify the Contractor accordingly. The Contractor shall forthwith take such steps, at his own expense and to the approval of the Engineer, as may be considered necessary to achieve water tightness.

In the event of the steps taken by the Contractor proving ineffective in reducing the rate of drop in water level over a period of 7 days to less than 5 mm depth per 24 hours plus an allowance for evaporation the Engineer shall have the right to order the Contractor to carry out at his own expense, approved steps, on completion of which the Contractor shall again clean out and test in the manner specified also at his own expense.

Notwithstanding the fact that a structure may have passed the test described in the aforementioned paragraphs, it will not be acceptable for any leaks or damp spots to show on any exterior surface. Any such defects shall be sealed and repaired in a manner and to a standard acceptable to the Engineer.

Upon satisfactory completion of the test the structure shall be left full of water unless otherwise ordered by the Engineer.

In the event of leakage being evident at any time during the Defects Liability Period, the Engineer, before issuing his Final Certificate may call for further rectification and testing as already described and will have the right to withhold this Certificate until he considers the work to be satisfactory.

PSG 7.3 ACCEPTANCE CRITERIA FOR STRENGTH CONCRETE

ADD THE FOLLOWING:

"Test results obtained from the supplier of ready-mixed concrete will not be accepted for evaluation in terms of subclause 7.3, but samples for testing shall be taken of such concrete at the point of placing."

ADD THE FOLLOWING:

PSG 7.3.6 Tolerances-possible deviations

The degrees of accuracy of construction shall be as follows:

- a) Overflow weirs – Degree I accuracy.
- b) All other water retaining structures – Degree II accuracy.
- c) All other non-visible elements (excluding those for water retaining structures) – Degree III accuracy.

PSG 8 MEASUREMENT AND PAYMENT

PSG 8.1 FORMWORK

PSG 8.1.1.2 Formwork in narrow widths (Sub-clause 8.1.1.2 and 8.2.5)

All narrow formwork (up to 300mm wide) irrespective of width, shall be measured in running metres and payment shall be per metre.

PSG 8.1.2 Reinforcement

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No differentiation shall be made between size or diameter of the reinforcement. The rate for steel bars shall cover the cost of the supply, cutting, bending and fixing.

ADD THE FOLLOWING:

PSG 8.1.3.4 Blinding layer

The area of blinding layer shall be measured in square metres to the nett outline of the structure. Payment for blinding shall include for any formwork required to the edge of blinding.

PSG 8.1.3.5 Joints

The designated joint types shown on the drawings and scheduled will be measured separately by the length of joint installed.

The unit rate shall cover the cost of all materials, plant and labour for the construction of each joint type as specified or shown on the drawings including the cost of formwork, treatment, waterstop, sealant, joint, filler, etc. and treatment of the joint in accordance with Sub-clause 5.5.7.3 provision of the V-feature as specified where concrete is exposed, testing and making good.

PSG 8.1.3.6 Casting items into concrete

Measurement shall be by length or number as scheduled. The unit rates shall cover the cost of fixing in position all work associated with restraining the items during concreting and of modifying the formwork

PSG 8.5.1 Pipes through walls

The bided rates for boxing out holes and grouting in pipes and specials, shall cover the cost of boxing out the hole, preparation and concreting in as specified.

PSG 8.5.2 Holding down bolts and base plates

The holes boxed out for holding down bolts and base plates will be measured and paid in accordance with Sub-clause 8.2.6.

Grouting in of holding down bolts and base plates positioned by Others, will be measured in volume of non-shrink grout.

The bid rate shall cover the cost of supplying, mixing and placing of the grout and preparing the hole as specified.

PSG 8.5.3 Granolithic screed

Measurement will be in square meters of surface area covered and the unit rate shall cover the cost of all materials, labour and equipment required to provide the screed as specified.

PSG 8.5.4 Water tightness testing

Payment for water tightness testing will be made under the specified items for each structure in the Schedule of Quantities. The sum bided shall include for the cost of filling and emptying the structure, for sealing pipes and openings and for taking all measurements.

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PSHA: STRUCTURAL STEELWORK (Small Works)
(Applicable to SANS 1200HA)

PSHA 3 MATERIALS

PSHA 3.1 STRUCTURAL STEEL (Sub-clause 3.1)

PSHA 3.1.1 New structural steel

Add to the Sub-Clause:

All structural steelwork which shall include ladders, safety cages and platforms, shall be manufactured from GRADE S355JR grade steel in conformity with EN 1005-2-S355JR, except where shown to the contrary on the drawings or in the schedule of quantities.

Stainless steel shall be ANSI grade 304 L or, where no welding is required grade 304, except where shown to the contrary on the drawings or in the schedule of quantities.

Grade 3CR12 corrosion resistant steel shall be used where scheduled or shown on the Drawings. The chemical composition and properties of this steel shall be as set forth in the publication "Fabricating 3CR12 Corrosion Resisting Steel" issued by Middleburg Steel and Alloys (Pty) Ltd.

Welding shall comply to SANS 044 Part 111, SANS 044 Part iv and SANS 0162.

PSH 5 CONSTRUCTION

PSH 5.1.2 Shop Details

Add to the Sub-Clause:

The Contractor shall prepare his own shop details based on the dimensions and details given on the Drawings and will be required to submit his shop details to the Engineer.

He shall submit the shop details to the Engineer at least 14 days before commencement of fabrication.

PSHA 5.2 GENERAL METALWORKS

PSHA 5.2.4 Ladders

Ladders shall be manufactured in accordance with the details and general arrangements shown in the drawings in lengths suitable for hot-dip galvanizing. All ladders and their fixings shall be hot dip galvanized.

PSHA 5.2.5 Prefabricated and chequer plate covers

Open grid steel covers and floor panels shall be pressure locked and welded as "Maclock" type "Eggcrate" or similar approved, and together with frames shall be hot-dipped galvanized after manufactured. All span bars shall have a depth of 40mm and be of such a width and at such a spacing that the maximum deflection of any bar under a 10kN/m² uniformly distributed load shall not exceed 1/360 of the clear span.

Under no circumstances will cutting and welding be permitted on site.

Framing to open grid "Maclock" or "Eggcrate" covers, or panels shall be assembled and welded to the detail as shown on the drawings.

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The galvanized steel flooring shall be fully washed and cleaned as specified, and when dry shall receive one coat of epoxy tar compound to a dry fill thickness of 100 microns.

Chequer-plate flooring shall be of 6mm minimum thickness "treadplate" flooring or similar approved with raised 5-bar pattern and lifting key holes at each end of each plate.

Frames shall be of 3CR12 angle and bar welded together and as detailed on the drawings.

All ferrous metal covers, flooring and frames shall be hot-dipped galvanized to SANS 763, except for 3CR12.

PSHA 5.2.6 Handrails

Handrails shall be of the two-rail type, ball and stanchion top mounted, type Mentis MT 90 or similar. Corrosion protection shall be hot-dipped galvanized in accordance with Sub-clause 5.2.14.3.

PSHA 5.2.8 Open grid flooring

Corrosion protection for the open grid steel flooring, including frames, shall be in accordance with Sub-clause 5.2.14.3.

PSH 5.7.5 Sluice Gates, Frames and Operating Gear

Add new Sub-Clause:

Sluice gates, frames, guides, operating spindles etc, provided under this contract shall be manufactured in 304 stainless steel and designed for a working pressure head for seating and unseating conditions as scheduled in the Bill of Quantities.

Where gates and frames are to be provided and installed by the Mechanical Contractor in compliance with the requirements shown on the Drawings. Frames will be set into position in previously prepared grooves and grouted up. Grouting up of frames will be carried out under the supervision of the Mechanical Contractor. Care is to be taken to maintain the correct alignment of the frame during concreting.

PSH 5.7.6 Pipe Clamps and Brackets

Add new Sub-Clause:

Clamps and brackets around pipes are to be constructed in 304SS to the details shown on the Drawings and are to be provided with all necessary bolts for fixing to concrete.

PSH 5.7.7 Headstocks, Spindles and Hand wheels

Add new Sub-Clause:

Headstocks are to be provided where indicated, assembled from 75 mm internal diameter 304SS piping and standard fittings. Each headstock shall be provided with the necessary operating spindle, of the required length (to suit the location of the headstock above the valve), any necessary support brackets and bearings for the spindle, all holding down bolts for fastening to concrete and a hand wheel. The spindle shall be capable of transmitting a torque of at least 150 Nm without damage and shall be corrosion resistant to suit the in-situ working environment.

PSHA 5.3 ERECTION AND INSTALLATION

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PSHA 5.3.7 Repair to paint and site painting

All mild steel items not suited for hot dip galvanized shall receive the following treatment at the shop of an approved painting sub-Contractor.

All internal and external surfaces shall be blast cleaned to Swedish Standards SIS 05/09/00 SA 3 to s surface profile not exceeding 75 micro-meters. The surface shall be moisture-free and free of soluble salts and airborne contaminates and shall be painted with a twin pack polyamide cured high build epoxy coating to a minimum dry film thickness of 200 micro-meter and the maximum 300 micro-meters.

Where a decorative or colour-coated finish is required (e.g., crane rails and roof trusses) a vinyl copolymer paint shall be used.

Undercoats shall be applied in accordance with the manufacture's recommendations and all coats shall have a total dry film thickness of 200 micro-meters. The first coat of paint shall be applied within two hours of blast cleaning. The time period between subsequent coats shall be in accordance with the paint manufacture's requirements.

ADD THE FOLLOWING:

PSHA 5.3.8 Painting of galvanized mild steel items

Galvanized items to be painted and not in contact with Wastewater, shall be non-passivated and degreased after erection, painted with a vinyl copolymer system applied in accordance with the paint manufacture's specifications.

The minimum dry film thickness of the paint system shall be 100 micro-meters.

All galvanized items which are intermittently or permanently in contact with wastewater shall be feather blasted after galvanizing. The surface shall be moisture-free and free of soluble salts and airborne contaminates and shall be painted with a twin pack poly-amide-cured high build epoxy coating.

PSHA 5.3.9 Cast-iron items (Including valves)

All cast iron items to be installed underground or not exposed to view, shall be twice hot bitumen dipped, using different shading bitumen inside and outside

Casting iron items to be cast into concrete shall be degreased and nylon brushed.

Cast iron items which are specifically schedules as "twin pack epoxy painted", shall be blast cleaned and painted with a twin pack polyamide cured high-build epoxy coating.

Cast iron items where painting is specified and which are exposed to view but not in contact with wastewater, shall by nylon brushed and degreased, then painted with a vinyl copolymer paint system in accordance with the manufacturer's recommendations. Cast iron valves not generally exposed to view (i.e., manholes), must be painted.

PSHA 5.3.10 Galvanizing

Steelwork scheduled of shown on drawings to be galvanized, shall be galvanized in accordance with the requirements of ISO 1461 and the thickness of the coat shall be as specified in Sub-clause 4.3.1 Table 1 (profile sections 65 micro-meters: tubular sections 45 micro-meters).

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Where hot dipping is specified for tubes and fittings 200mm diameter and larger, they shall be cleaned to SA 22 and grit blasted prior to galvanizing.

Members and assembled units which are too large to be dipped in the galvanizing bath, may be zinc sprayed provided that they are cleaned as required by Appendix C-7 of SANS 763 and provided the coating gives protection to the steelwork equal to that specified for galvanizing above.

The repair to galvanizing damage by welding, shall be achieved by the application of two coats of single pack zinc-rich epoxy primer.

PSH 6 TOLERANCES

PSH 6.2.3 Weir plates

Add new Sub-Clause:

Weir plates shall be installed and set to the relevant structures to within ± 1 mm of the designated level in the vertical plane.

PSHA 7 TESTING

ADD THE FOLLOWING:

PSHA 7.4 Testing and inspection of corrosion protection

The paintwork shall be tested and inspection by an approved inspection service at the relevant stages of the Contract. The Contractor shall make the necessary arrangements for testing with the inspection service at the various stages as approved by the Engineer and shall submit all these reports to the Engineer for approval. All damaged areas shall be repaired in accordance with the paint manufacturer's requirements.

Final approval of the paintwork shall be given by the Engineer when the works are commissioned.

PSHA 7.5 Repairs to paint

On arrival on Site and both before and after erection, all items of steelwork shall be examined for damage to the paintwork, and damaged areas degreased, derusted and repaired. The damaged area shall be ground down to at least SA 22. The surrounding paintwork, which is still intact, shall be feathered for a distance of 20mm beyond the damaged area. The whole shall then be repainted as specified herein. Under no circumstances will the use of wire brushes be permitted for the removal of rust or other contaminants. If more than 10% damaged, removed from site, strip and repaint.

PSHA 8 MEASUREMENT AND PAYMENT

PSHA 8.1 Basic principles

Replace Items 8.2.1 and 8.2.2 with:

Unless stated otherwise, scheduled metalwork will be measured by number or square of linear meters, including wastage and fastenings.

The rate will be held to include for the supply, testing, fabrication, delivery and erection of the metalwork, corrosion protection, delivery and erection of the metalwork, corrosion protection, together with all operations specified in all Sub-clauses of Clause 3 hereof and also for the supply and fixing of all anchor/holding down bolts, bolts, nuts, washers and plates.

ADD THE FOLLOWING:

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PSHA 8.2.5 Hand railings

Hand railings will be measured by the length of the complete balustrade, including top rail, middle rail and stanchions as well as end pieces and corners. The unit rate will be held to include for all materials and fastenings supplied, for welding, erection and protective coatings and for providing and grouting in holding down bolts.

PSHA 8.2.6 Ladders

Ladders will be measured by number or specified length. The unit rate will be held to include for all materials and fastenings supplied, for welding, erection and protective coatings.

PSHA 8.2.7 Prefabricated open and chequer plate covers and flooring

The open grid or chequer plate flooring covers or panels will be measured by area, and the unit rates will be held to include for all cutting and welding, etc. At the factory, prior to galvanizing, for the frame, installation, galvanizing and paint and the rate will be held to include for the supply and fixing complete, including all cement mortar and bolts which may be required to secure the frame.

PSHA 8.2.8 Testing and inspection of corrosion protection

The rate bided for steelwork items, shall include for testing and inspection of corrosion protection.

PSHB: CLADDING AND SHEETING

(Applicable to SANS 1200 HB: 1985)

PSHB 1 MATERIALS

PSHB 1.1 Sheetting & Cladding (Colour to be advised by the Engineer)

PSHB 1.1.1 Roof sheetting shall be 0,6 mm Chromadek IBR profile sheet

PSHB 1.1.2 Side cladding shall be 0,6 mm Chromadek IBR profile sheet

PSHB 1.1.3 Flashing and ridgings shall be 0,8 mm Chromadek sheet all to match the roof sheetting and side cladding.

PSHC: CORROSION PROTECTION OF STRUCTURAL STEEL

(Applicable to SANS 1200 HC: 1988)

PSHC 5.9 Application of Metal Coatings

Add to the Sub-Clause:

The grade of hot dip galvanising (HDG) required shall be that for ISO 1461-1999 heavy duty coatings carried out in accordance with that specification. This shall be applicable to all metalwork where HDG is called for either on the Drawings or in the Schedule of Quantities.

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Contractor

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PSHC 8

MEASUREMENT AND PAYMENT

PSHC 8.1

Principles

PSHC 8.1.1

Units

Add the following to the Sub-Clause:

Separate payment for corrosion protection of structural steel shall only be made when so scheduled in the Schedule of Quantities.

When not so scheduled, the cost of the corrosion protection work shall be deemed to be included in the price tendered for the structural steelwork.

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PSL: MEDIUM PRESSURE PIPELINES
(Applicable to SANS 1200 L)

PSL 2 **INTERPRETATION**

PSL 2.1 **REFERENCES**

PSL 2.1.2 **Supporting Specification**

ADD THE FOLLOWING TO THIS SUB-CLAUSE:

- “(h) ANSI B16.9 specification of seamless carbon steel fittings
- (i) SANS 719: Electric welded low carbon steel pipes for aqueous fluids (ordinary duties)
- (j) API 1104: API Standard for welding pipelines and related facilities
- (k) BS4515: Field welding of carbon steel pipelines
- (l) SANS 1123: For flanges and accessories
- (m) SANS 135: For bolts
- (n) SIS 05590-1967: Swedish Code of Practice for surface treatment
- (o) SANS 044: Welding procedures and welders”

PSL 3 **MATERIALS**

PSL 3.1 **GENERAL**

ADD THE FOLLOWING PARAGRAPHS:

"Each type of pipe delivered to the Site shall be of a standard length corresponding to the standard lengths offered by the pipe manufacturer in his catalogue, with a maximum permissible variation in length of $\pm 2\%$.

A pipe that is shorter or longer than the defined standard will be rejected by the Engineer, except when such non-standard lengths are required in terms of the Contract and have been specifically manufactured or cut as such by the pipe manufacturer or supplier."

PSL 3.4 **STEEL PIPES, FITTINGS AND SPECIALS**

PSL 3.4.3 **Pipes of Nominal Bore over 150mm**

ADD THE FOLLOWING PARAGRAPHS:

"All mild steel pipes and fittings other than screwed and socketed pipes, shall comply with the requirements of SANS 719 grade A. Specials shall be manufactured from straight pipes in accordance with the relevant requirements of BS534. All welding in pipes and specials shall be electric fusion welding.

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Contractor

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All mild steel pipes and fittings shall be protected against corrosion in accordance with clause PSL 3.9.

Plain ends of pipes and fittings shall be covered and protected against damage while being transported from the factory to the Site.

The Contractor is responsible for preparing detailed dimensioned pipe schedules for the approval of the Engineer prior to the start of fabrication of the pipes, fittings and specials.

The Engineer will supply a general arrangement drawing of each pipeline showing its start and end points as well as its horizontal and vertical alignment together with positions of valves and other specials

The Contractor will be responsible for detailing each individual pipe and pipe special. Site welding shall not be permitted due to its deleterious effect on linings and coatings. All pipes and specials shall be eminently suitable for receiving internal linings as specified.

Welding and visual examination of mild steel piping shall be carried out in accordance with BS 4871 Part 1, BS 2633 or BS 4515 as appropriate. Dye penetration examination shall be undertaken on not less than 10 % of all welds."

PSL 3.4.4 Fittings and Specials

ADD THE FOLLOWING TO THIS SUB-CLAUSE:

"All pipe specials shall be accurately made to the sizes and dimensions specified or given on the drawings and/or Schedule.

Unless otherwise specified, segmented steel bends shall be made with a radius equal to 2.0 times the pipe diameter. If details of segmented bends are not provided, the bends shall have one mitre weld each, up to and including a deflection angle of 22.5° and two mitre welds each up to and including 45°, and three mitre welds each up to and including 90°.

All other fittings and specials (excluding pipe bends) to be in accordance with SANS 719 unless otherwise indicated on the drawing.

The vertical axis of all fabricated steel items shall be accurately identified by using paint marks on the pipe ends."

PSL 3.4.5 Welding Operators and Procedures

ADDITIONAL CLAUSES AFTER 3.4.4:

"PSL 3.4.5 Competence of Workmen

"The Contractor shall employ only competent and coded welders and shall submit certificates proving the competence of welders. The Engineer will ask for additional competence tests if and when required."

PSL 3.4.5.1 Qualification Tests for Welding Procedure

The qualification tests for welding procedure shall be carried out generally in accordance with the requirements of the American Petroleum Institute API 1104. Manufacture shall be established, and the quality of the welds so produced shall be determined by carrying out ONE transverse tensile weld test and TWO guided cold bend tests on suitable coupon plates.

The tests are to be carried out either before manufacture of the pipes to be supplied under this contract is commenced or before the manufacture of pipes more than a number previously agreed by the Engineer is carried out.

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The coupon plates shall be prepared either from plates of the same material as the pipe and welded in a similar manner to that to be used during production, or by cutting suitable specimens from a pipe selected at random by the Engineer from the first production pipes. The coupon plate for the tensile weld test and those for the guided cold bend tests shall be prepared in accordance with the requirements of SABS 719.

The qualification tests shall be considered satisfactory if:

- a) The weld has a joint efficiency greater than 95% of the minimum specified tensile strength of the parent metal and,
- b) the bend test specimens are capable of being bent around a former with a diameter equal to six times the nominal thickness of the plate to an angle of 180 degrees without developing a crack, except at the arises of the specimen, of length or width greater than 3 mm.

Failure to pass the above qualification tests shall result in the rejection of any pipes welded with the procedure used and the preparation of a new qualification of procedure test.

Any changes in the electrode case type used or change of flux used shall require a qualification test before approval of the procedure is granted.

PSL 3.4.6 Welding Procedure

Welding is to conform to the latest edition of API 1104 and BS 4515 field welding of carbon steel pipelines.

Before the start of any welding work under this Contract, the Contractor shall submit his proposed welding procedures of the various types of welds to the Engineer for approval. The Engineer may require procedures to be qualified by destructive testing.

Once the welding procedures have been approved, no modifications will be allowed without the consent of the Engineer in writing.

No welding shall be done until the welding procedures and welders have been properly qualified in accordance with the procedure and performance qualification test requirements of SANS. Exception may be allowed if the fabricator can submit records of such tests which have been made by an independent inspection authority."

Add new Sub-Clause:

The Contractor shall include in his prices for the supply of pipes, fittings and specials, the cost of carrying out, under the supervision of the inspector appointed by the Employer, examination of shop welds on the following basis:

PSL 3.4.6.1 Pipes

- a) FIVE percent random radiographic examination of all welds deposited by an approved automatic process.
- b) TEN percent random radiographic examination of all welds deposited manually or semi-automatically, and repairs to welds done by an automatic process (should require repairs exceed 25% of the tests the percentage of examination shall be increased to TWENTY per cent).

PSL 3.4.6.2 Fittings and Specials

- a) ONE HUNDRED percent radiographic examination of all welds deposited manually or semi-automatically in specials and fittings which cannot be hydraulically tested.
- b) TEN percent radiographic examination of all welds deposited manually or semi-automatically in specials and fittings which are to be tested hydraulically.

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Contractor

Witness 1

Witness 2

The Engineer shall in all cases determine which welds are to be radiographed on the quantity basis specified above. All radiographs and records thereof made by the Contractor shall be made available to the Engineer to enable him to determine whether the welds are acceptable or not and no lining or wrapping of pipes shall be permitted until the welds have been accepted by the Engineer. To avoid unnecessary delay, at the option of the manufacturer, radiographs may be approved by the manufacturer's inspectors subject to them being subsequently approved by the Engineer.

When a section of the weld is shown by radiography to be unacceptable and if the limits of the deficient weld are not defined by the radiograph, additional radiography shall be carried out at the Contractor's expense until the limits of the deficiency are determined.

Repairs shall be made to defective welds at the Contractor's expense. All repair welds shall be identified with a stamp marking, indicating which welder conducted the repair. All repaired welds shall be radiographed at the Contractor's expense but after any repair welder has had ten consecutive repairs approved, the extent of the radiography of the repairs conducted by that welder may be decreased by agreement between the Engineer and the Contractor.

PSL 3.4.7 Production Testing of Welds

Add new Sub-Clause:

The Contractor shall include in his prices for the supply of pipes, the cost of carrying out at the factory, non-destructive tests of shop production welds (additional to the qualification tests for welding procedure) on the following basis:-

One pipe from each one hundred pipes produced shall be selected at random and specimens for two guided cold bend tests and one transverse tensile test shall be cut therefrom and tested in accordance with SABS 719, Section 7.

In the case of the guided cold bend tests, where welding is carried out from one side only, bend specimens shall be tested with the rest of the bend in tension, where welded from both sides the specimens shall be tested with the inner and outer welds in tension alternately.

Tensile tests shall be carried out as for the qualification tests.

The pipes from which successfully tested specimens have been taken shall be trimmed to the maximum possible length and shall be accepted by the Employer for payment purposes as full standard pipe lengths.

In the event of the welds of any pipe failing to reach the standard of acceptance, such pipe shall be rejected. Two further plate coupons shall be prepared from different pipes, selected at random by the Engineer, for each specimen that has failed to reach the required standard. In the event of such additional tests proving to be satisfactory repairs to the pipe originally failing any test will be permitted by the Engineer and such repairs and subsequent re-test shall be at the Contractor's expense. In the event of the additional tests also failing to reach the required standard, the Engineer shall have the right to reject the entire batch of pipes from which the coupon plates were cut.

PSL 3.7 OTHER TYPES OF PIPES

PSL 3.7.1 uPVC pipes

The pipes to be used for this contract shall be uPVC pipes to SANS 966, Polyethylene pipes to SANS 533, steel pipes and hot dipped galvanized of medium class to SANS 62.

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Fittings for uPVC pipes shall be socket ended cast-iron fittings to SANS 546.

PSL 3.7.2 Polyethylene Pipes

Add to the Sub-Clause:

HDPE and LDPE pipes shall be of the classes scheduled. Jointing of pipes shall be by means of welding, by bolting up welded-on flanges or by the use of approved external compression type fittings (Plasson or similar approved).

PSL 3.7.3 Concrete Non-Pressure Pipes

Add new Sub-Clause:

Concrete non-pressure pipes shall conform to SABS 677 for Class 50D and 75D pipes with ogee joints, and be in standard lengths of 2,44 m.

PSL 3.7.4 Glass Reinforced Polyester pipes and fittings

Glass reinforced polyester pipes and fittings shall conform to ASTM D3754 and AWWA C950 fibre glass pressure pipes. The pipes and fittings shall be of stiffness class 5000 N/m² unless otherwise specified.

PSL 3.8 JOINTING MATERIALS

PSL 3.8.3 Flanges and Accessories

ADD THE FOLLOWING TO THIS SUB-CLAUSE:

"The drilling of steel and CI flanges shall conform to the requirements of SANS 1123 or BS 4504: Part 1, as applicable, appropriate to the class of pipe specified, except that in the case of flanges for air valve matching tees, the drilling shall conform to the drilling of the valve supplied. It is the Contractor's responsibility to ensure that the flange sizes and drilling match.

All flanges for pipes of nominal bore up to 150mm shall be full face slip-on flanges made of ASTM A 105 grade 1 steel to ANSI B16.5.

All flanges for pipes of nominal bore exceeding 150mm shall be full face flanges made of grade 43 steel to BS 4360 (or equal). Bolts shall be made from grade B steel to ASTM A307.

Stainless steel bolts are to be used for all stainless-steel flanges (where applicable).

Wall or puddle flanges shall be made of flat iron, 75mm X 8mm thick, welded to pipe specials on both sides of the flange.

Any item of pipework, special or valve that has flanges which are incorrectly drilled will be rejected. Reaming of bolt holes to oversize dimension to make a piece fit will not be permitted. All flanges shall be machined overall with gramophone finish in accordance with SANS 1123.

Where stainless steel flanges are to be bolted to mild steel flanges, isolating bushes and washers are to be used to electrically isolate two connected pipe sections. Gaskets used shall have adequate isolating capacity in terms of cathodic protection requirements.



Employer



Witness 1



Witness 2



Contractor



Witness 1



Witness 2

Material for gaskets on flanged joints shall comply with the requirements of BS 4865 and be cut to the full width of the flange. The material shall be selected to accommodate the maximum conditions of temperature, pressure, and to be compatible with the material conveyed."

PSL 3.8.4 Loose Flanges

ADD THE FOLLOWING TO THIS SUB-CLAUSE:

"Slip-on flanges, when required, shall be welded inside and outside and shall be manufactured from the same steel as is specified for the pipes, and shall be in accordance with SANS 1123.

There shall be a distance from the face of the flange to the pipe end equal to the pipe wall thickness plus 3mm. The seal weld shall be applied so that the flange face shall be free of weld spatter and does not require re-facing.

Unless otherwise indicated, the flange bolt holes shall be orientated to straddle the vertical centreline in the case of vertical flange face. For horizontal flange face, bolt holes shall straddle the north-south centrelines."

PSL 3.8.8 Bolts, Nuts and Fasteners

ADD THE FOLLOWING NEW SUB-CLAUSE:

"Bolts and nuts shall comply with the relevant requirements of SANS 1700. Locking devices for nuts shall be provided wherever there is a possibility of the nuts becoming loose during service. All bolts, nuts and washers shall be hot dip galvanized in accordance with SANS 14713, unless stainless steel is specified.

Washers of the same or compatible material as the bolts shall be provided at each nut. The use of multiple washers will not be accepted. Spring washers together with flat washers shall be fitted to all nuts subject to vibration. Bolts shall project not less than 3mm and not more than 8mm from the head of the nuts after tightening. Projections on individual and common flange sets shall be identical."

PSL 3.8.9 Couplings

ADD THE FOLLOWING NEW SUB-CLAUSE:

"General purpose flexible couplings for M.S. and 3CR12 pipelines shall be "Viking Johnson" or similar type as approved by the Engineer and manufactured from the same material as the pipes to be coupled. Nuts and bolts shall comply with Sub-clause PSL 3.8.8.

All buried couplings shall be completely wrapped in "Denso" or equal approved mastic impregnated tape after installation and testing.

All exposed couplings shall be coated to the same specification as the pipeline in which they are used."

PSL 3.9 CORROSION PROTECTION

PSL 3.9.2 Steel Pipes

ADD THE FOLLOWING TO SUB-CLAUSE 3.9.2.2 AND CHANGE THE HEADING ACCORDINGLY:

"PSL 3.9.2.2 Steel Pipes, Flanges, Specials, Fittings and Valves including and over 150mm nominal bore

Where mild steel pipes are erected above water level, unless otherwise specified, the inside and outside of pipes shall be corrosion protected in accordance with the following:

- (a) Surface Protection

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All surfaces shall be abrasive blast cleaned to produce and Sa2½ finish as specified in Swedish Code of Practise SIS 055900-1967.

- (b) The primer coat shall consist of one coat of red lead zinc phosphate primer applied by brush or airless spray. Dry film thickness of this coat shall be a minimum of 37 microns. The primer coat and surface preparation shall be completed prior to delivery to site.

- (c) Finishing Coats

Following erection, all areas of damage of the primer coat shall be suitably cleaned and patch primed. The finishing coat shall consist of 2 coats High Metal Content Aluminium (25 microns each).

Prior to application of the finishing coats, the pipe shall be washed down and thoroughly cleaned to remove all traces of dust, oil grease, soluble salt and other contaminants, dried and painted immediately thereafter. Paint shall be applied using brushes or rollers of good quality. Application shall be smooth and continuous to provide the specified dry film thickness. Where pipes rest on plinths, the full coating system shall be applied to the areas which will be inaccessible before laying the pipe on the plinths.

All cast in steel items on plinths to be treated to the same specification.

All mild steel pipes and specials, installed in exposed positions (i.e. not buried in ground), are to be lined with an approved epoxy system (COPON or similar approved) to give a total dry film thickness of at least 250 microns.

All pipes, specials and fittings installed below ground level are to be coated and wrapped with a double layer of bitumen-impregnated glass fibre complying with the requirements for Type 1 of SANS 1130 to form a coating of average thickness 5 mm and of minimum thickness 4.5 mm and, on completion of the coating, white washing of the sheathing."

PSL 3.9.3 Protection against electrolytic corrosion

ADD THE FOLLOWING TO SUB-CLAUSE 3.9.3:

"All underground flanges, flange adapters and flexible couplings, including all bolts, nuts and washers, are to be cleaned properly, given a uniform coat of petroleum-based primer, a petroleum mastic applied in all corners, around bolts, nuts, etc., wrapped with a petroleum based impregnated tape (DENSO or similar approved) and a polyethylene outer wrap.

All underground welded joints and fittings shall be cleaned properly, given a uniform coat of petroleum-based primer, coated, and wrapped with a petroleum based impregnated tape (DENSO or similar approved) and a polyethylene outer wrap.

Welded joints to be repaired to the original specification.

Unprotected inside surfaces of pipes and specials, especially after site welding, shall be treated in accordance with the type of lining specified for the pipe sections.

The electrical continuity between mild steel and stainless-steel pipe connections (or any other dissimilar metals) shall be broken by the installation of isolation kits, certified fit for this isolation purpose."

PSL 3.9.6 Corrosive Soil

ADD THE FOLLOWING TO SUB-CLAUSE 3.9.6:

"Steel pipes in contact with corrosive soil shall be wrapped with Densopol 80 HT or an equivalent approved product, strictly in accordance with the manufacturer's instructions."

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PSL 3.10 VALVES

DELETE THE CONTENTS OF THE SUB-CLAUSE AND REPLACE WITH THE FOLLOWING:

“PSL 3.10.1 Gate Valves

Gate valves shall comply with the following as applicable:

- (a) for working pressures up to 1600kPa and over DN 50 but not exceeding 600mm shall be of cast iron and shall comply with the relevant requirements of SANS 664.
- (b) for working pressures over 1000kPa and of diameter exceeding DN 600 shall be of cast steel and shall comply with the material and construction requirements of SANS 191 and with dimensional requirements of the approved manufacturer.
- (c) the outlet connections shall be flanged, or spigot plain ended as scheduled.
- (d) the spindles shall be rising and made from either zinc-free bronze, 304 stainless steel or as approved.
- (e) the spindles shall be fitted with hand wheels.
- (f) the direction of closing shall be clockwise.
- (g) the valve design shall be such that it may be opened or closed against the differential pressure specified in the Project Specification or schedule, with an effort applied by one man of 200N exerted simultaneously with each hand on the rim of a standard handwheel, or on the cross bar of a tee key with hands spaced 900mm apart (total effort 400N). In order to achieve this, gate valves shall be fitted as required with either plain or ball thrust bearing, spur gearing and close-machined channel guides and shoes.
- (h) for working pressures above 1000kPa and valves of DN 250 and under, and all valves of DN 300 and over, valves shall be fitted with a spur reduction gear having an advantage of not less than 2:1.
- (i) for working pressures above 1000kPa valves shall be fitted with ball-bearing spindle thrust collars.
 - i) the seat rings shall be pinned and manufactured from either phosphor bronze in accordance with BS 1400 (zinc-free bronze), 304 stainless steel or as approved.
 - ii) alternatively, resilient seal valves (RSV) may be offered. The gate of the RSV shall be completely covered by natural or an approved neoprene rubber to a minimum thickness of 1 mm and pinhole free.
- (j)
 - i) the gland packing shall be lubricated, and graphited cotton packing provided in accordance with the requirements of BS 437 Type A.
 - ii) two rubber "O" seal rings of an approved design shall be provided.
- (k) the design of all valves shall be such that they may be mounted vertically; and
- (l) flanged valves shall be drilled off-centre.

PSL 3.10.2 Butterfly Valves

Butterfly valves for working pressures up to 2500kPa shall comply with the relevant requirements of BS 5155 and the following:

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- (a) The valve shall:
 - i) be manufactured from materials as specified in Table 3 of BS 5155.
 - ii) be suitable for connecting to pipe flanges by individual bolting.
 - iii) have a replaceable stainless steel or zinc-free, phosphor bronze (both of an approved quality) seat mechanically fixed to the body and a resilient rubber or neoprene seal, replaceable and adjustable on site, mechanically fixed to the edge of the disc.
 - iv) be suitable for flow in either direction, capable of use as a regulating valve and shall shut off drop tight, and have a maximum working pressure as stated in the Project Specification.
 - v) be clockwise closing.
 - vi) be designed for installation with the main shaft horizontal and the operating shafts vertical.
 - vii) be designed such that it may be opened or closed against the differential pressure specified in the Project Specification or scheduled, with an effort not exceeding 250N on the handwheel in the case of valves up to 300mm in diameter, and not exceeding 400 N on the handwheel in the case of larger valves.
- (b) the seal retaining rings and screws shall be of an approved stainless steel or zinc-free, phosphor bronze.
- (c) the main shaft shall be offset from the centreline of the disc so as not to pass through the seal.
- (d) the body ends shall be flanged and drilled off centreline; and
- (f) the valve assembly shall be protected against corrosion in accordance with the requirements of PSL 3.9.

Each valve shall be supplied with a certificate certifying that it complies with the requirements of this specification and that it has been tested and inspected in terms of BS 5155.

PSL 3.10.3 Air Valves

Air valves for water shall be Vent-O-Mat type RBX or equal approved.

- (a) The body for all types of air valves shall be:
 - i) for working pressures up to 2500kPa, cast iron or stainless-steel cylindrical body with ends that conform with the relevant clauses of BS 1452 for Grade 220, and
 - ii) for working pressures exceeding 2500kPa, cast steel.
- (b) Each air valve shall be supplied with:
 - i) a bronze isolation cock, (for DN 25 valves only), and
 - ii) flanged isolating RSV gate valve as specified in PL 3.10.1.
- (c) Each double or multiple orifice air valve (flanged) shall be fitted with a suitable drain cock to release the pressure inside the valve when the isolating valve is closed at a time when the float is sealing the large orifice.

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- (d) Unless otherwise specified in the Project Specification, single, small orifice air valves shall be capable of releasing automatically under normal operating pressure and conditions any air entrapped in the pipeline, and shall be of the lever type with a 316 stainless steel ball, and
- e) Triple orifice air valves shall be provided with cast iron shield plates so designed as to prevent the entry of dirt when the large orifice is open.”

PSL 4 PLANT

PSL 4.4 Packing

Add new Sub-Clause:

Goods should be suitably packed in such manner as will ensure safe and efficient transport to site, and the Contractor shall include in his prices for whatever packing may be necessary in this respect. Small items particularly liable to damage or loss in transit should be crated. All crates and packing material shall, after use, become the property of the Employer unless distinctly specified otherwise, or if returnable, shall be so at the Contractor's expense.

PSL 4.5 Protection of Linings during Transportation

Add new Sub-Clause:

The ends of every pipe, fitting and special shall be fitted with suitable end closures as a precautionary measure against damage being caused to the lining material or coating. The end closures shall be capable of preventing the ingress of dirt but at the same time allowing air to ventilate through the pipework which they protect. They shall be secured in such manner that they cannot be dislodged or damaged by normal pipe handling operations.

PSL 4.6 Marking

Add new Sub-Clause:

- a) Each pipe fitting, special, coupling and valve shall bear the Contract Number followed by the Item Number given by the Engineer and a Despatch Number allocated consecutively by the manufacturer.
- b) Closure pipes (trued for diameter throughout their length) shall, in addition to the marking required above, carry two longitudinal brown stripes, 50 mm wide, diametrically opposite to each other and extending the full length of the pipe.
- c) Every bend shall be marked as stated above and, in addition, shall have its deflection angle in degrees and minutes painted on the outer surface.
- d) Packaged items such as nuts and bolts, insertion rings etc. shall be marked with a metal label bearing the Contract Number and the Item Number(s) with which they are to be used.

PSL 4.7 Advice Notes and Invoices

Add new Sub-Clause:

The Contractor shall submit one copy of every advice note in respect of each individual consignment, quoting the Contract Number, the truck or vehicle number, item numbers and brief description of the articles so consigned. The advice note shall be lodged with the Engineer's Representative on Site at least two days before the arrival of the goods.

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PSL 4.8 Delivery and Acceptance

Add new Sub-Clause:

The material to be supplied under this Contract shall be consigned and delivered to approved areas adjacent to the pipeline route or to an approved storage area if not required for immediate use.

PSL 5 CONSTRUCTION

PSL 5.1 LAYING

PSL 5.1.1 General

ADD THE FOLLOWING TO THIS SUB-CLAUSE:

“The pipelines shall be laid to straight grades to the levels and to the routes indicated on the drawings.

Pipes shall be laid free from cold stresses. No deflections shall be taken in curvature of pipes but shall be taken with approved bends with exceptions as hereinafter specified. All deflections in pipes with flexible couplings shall not exceed those recommended by the manufacturer of the couplings after making allowance for ground movements, etc. All deflections in the axis of butt-welded steel pipelines of 10° or less shall be made by mitring equally the ends of the two pipes to be joined so that the maximum mitre in any one pipe shall be 5°. Where the total deflection is 3° or less, the mitring may be made in one pipe end only. Ends to be mitred shall be carefully and accurately marked and then either machine cut, or machine planed. Hand planing will not be permitted. After mitring, the pipe ends shall be re-chamfered as described in Clause 4.1.5 of SANS 719.

The minimum gap between pipe end root faces before welding shall be 1,5 mm and the maximum gap shall be 3,0 mm. After mitring all pipe ends shall be thoroughly cleaned before the field weld is carried out. Where the Engineer gives written approval for cold bends, they shall be made by the cold stretch method in such a manner as to preserve the cross-sectional shape of the pipe. The minimum radius of any such bend shall be twenty-five times the outside diameter of the pipe. Approved bending shoes shall be used for bending of the pipes.

Snaking into the trench of butt-welded sections of steel pipeline which has been factory lined and/or coated will not be permitted without the written approval of the Engineer.

The Contractor may butt-weld factory coated and/or lined steel pipes together alongside the edge of the trench to form continuous welded pipeline sections up to a maximum length of 45 m and to lower each section into the trench, provided the pipe, coating and/or lining are in no way damaged during these operations and provided furthermore that the deflection of the pipe barrel at any point during any stage of the operation does not exceed 2% of pipe outside diameter.

During the welding of circumferential joints, the Contractor shall ensure that either rubber mats or other suitable material is laid in the pipe invert of epoxy lined steel pipes to protect the lining against damage by traffic or fall-out from arc welding at the joint. Care shall be taken not to stroke arcs on the epoxy lined areas adjacent to the weld joint. Immediately before welding of joints, the protective tape between the ends of concrete or epoxy linings and coatings and pipe ends shall be removed.

The Contractor shall ensure that pipes are strung in accordance with the Engineer's drawings for proper placement by diameter, wall thickness and specifications. Any movement of pipes resulting from failure to comply with these requirements shall be rectified at the Contractor's expense.



Employer



Witness 1



Witness 2



Contractor



Witness 1



Witness 2

Skids of enough shall be supplied to support the pipe to proper height. If pipe is supported over the trench, skids shall be of enough length to prevent collapsing of the trench and of sufficient strength to carry the pipe. For coated pipe enough skids shall be used to prevent damage to the coating."

PSL 5.1.1.1 Acceptance and Storage of Pipework Items

The Contractor will be responsible for clearing the areas required for pipe storage which shall include the removal of rock, stones, and all burnable material. He shall also be responsible for maintaining the area in a clean and tidy condition for the duration of the Contract. No separate payment will be made for this operation.

Upon delivery of the pipes, fittings, specials, and valves, they will be inspected jointly by the Engineer's Representative and the Contractor. Any pipes, etc., found to be damaged shall be returned to the factory for repair or replacement; in which case the costs of additional transport, repair or replacement shall be borne by the Contractor.

The Contractor will be held fully responsible for the care and safety of all pipes and fittings, etc., on site, and shall bear the cost of all renewals which may be necessary to make good losses, damages or breakages. Furthermore, he shall be fully responsible for handling and re-loading material at the storage areas and for transporting and offloading all such materials at their correct places along the pipeline route.

PSL 5.1.1.2 Distribution of Material

Before commencing pipe laying, the Contractor shall properly distribute pipes, fittings and specials, along the trenches. Valves and couplings shall not be distributed until they are actually required for laying in their designated positions.

PSL 5.1.1.3 Pipelaying Personnel

The laying of all pipework items shall be performed only by qualified persons who are registered by the local authority as artisans in the plumbing, pipefitting or drainlaying trades or who are qualified by reason of having attended and passed the course on pipelaying held by the Civil Engineering Industry Training Board.

PSL 5.1.2 Damage

Add to the Sub-Clause:

The Contractor shall be responsible for always protecting pipes etc. from grass fires. He shall keep grass cut short in the vicinity of all unlaied pipework items.

PS L5.1.4 Depths and Cover

Delete Sub-Clause 5.1.4.1 and substitute the following:

Unless otherwise shown on the drawings or scheduled in the Schedule of Quantities or ordered, the depth of excavation for trenches for medium-pressure pipelines shall be such that the cover to finished ground level over the laid pipe shall not exceed 1, 0 m.

Delete from the third and fourth lines of Sub-Clause 5.1.4.2.

"e.g. the deflection shall not exceed 1,5° per joint in the case of AC pipes"

PSL 5.1.5 Inundation of Pipe Trenches and Floating of Pipes

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Add New Sub Clause:

Should trenches be inundated by water, there is a risk of movement of the pipes by flotation. The Contractor shall ensure that trenches are not flooded by storm water and that pipes laid in the trench are backfilled as soon as possible after laying, except at joints made with couplings or flanges which must be kept visible until the pipeline has been satisfactorily tested. Welded joints may, after all specified testing has been satisfactorily completed and with prior approval from the Engineer, be backfilled at the same time as backfilling the pipeline.

Should movement of the pipes occur, the Contractor shall remove the pipes from the trench and thoroughly clean and relay the pipes on bedding repaired or replaced as necessary. This work shall be carried out at the Contractor's expense.

PSL 5.2 JOINTING METHODS

PSL 5.2.2 Flanges (Steel Pipelines)

ADD THE FOLLOWING TO THIS SUB-CLAUSE:

"Pipes shall not be aligned and levelled such that the pipes, specials and valves strain the flexible couplings. All precautions shall be taken to ensure water tightness for every type of coupling.

Where specified, pipes on both sides of flexible couplings shall be anchored across the coupling with tie rods or straps to prevent them pulling out."

Add to the Sub-Clause:

Before being brought together, the ends of the pipes, fittings, couplings and all flanges are to be inspected and cleaned to ensure that all parts forming the joint are undamaged and clean.

When jointing flanges after cleaning, approved jointing material, cut properly to size, is to be inserted immediately before bringing the two flanges together. Before closing the joints, the flanges must be parallel to each other, with all bolts inserted in the bolt holes. After the fittings have thus been aligned and well supported, the joint shall be bolted up to a uniform tightness around the periphery.

PSL 5.2.3 Site Welded Joints

Add to the Sub-Clause:

Plain ended steel pipes and the plain ends of corresponding specials are to be joined together by welding in accordance with American Standard API 1104. The pipe ends are to be prepared in accordance with that Standard. Welding shall generally commence at the top of the joint and proceed downwards. In addition to the root weld, at least two further passes shall be made, none of which is to exceed 3 mm in depth.

The Engineer shall have the right to specify that Qualification Tests be carried out for each welder employed on the works. No welder shall be employed who has not passed such tests and for whom a recent pass certificate issued by a competent authority cannot be produced.

TEN percent of field welded joints are to be tested by radiographic examination or some other approved method in accordance with Sub-Clause 7.2.2. The Engineer will make the necessary arrangements for such tests to be carried out by an inspection firm employed by the Employer.

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

After jointing and testing, the protective lining and wrappings are to be rendered continuous with the same materials as applied to the body of the pipe. Holiday detection tests shall be carried out in the field to ensure continuity of lining and wrapping.

The prices tendered for pipelaying are to include for any of the above work which may be entailed apart from inspections carried out by the Employer as per Sub-Clause 7.2.2.

PSL 5.2.4 Concrete Spigot and Socket Pipelines

Delete the first five lines of the Sub-Clause and substitute:

Where rubber joint sealing gaskets are required as flexible joints in a concrete pipeline, the applicable requirements of SABS 676 (or SABS 677) for the type of joint recommended by the approved manufacturer shall be used for making the joint.

PSL 5.2.5 Flexible Coupling Joints

Add new Sub-Clause:

Where ordered, steel flexible couplings are to be of a superior quality, approved type, each comprising one centre collar, two special flanges, two rubber rings and mild steel bolts.

Adapter couplings shall be of a similar design, but one end shall be flanged to enable connection of plain ended pipes to flanged specials.

Steel couplings shall be assembled strictly in accordance with the manufacturer's instructions.

In the event of the coupling collar having an internal central ring of register, the pipes shall be brought together until both pipe ends are in contact with the register, after which one pipe shall then be drawn back by 6 mm. Where the coupling has no internal register a 6 mm joint gap shall be central within the coupling.

PSL 5.2.6 Cut Pipes

Cut pipes may be used where required as closure lengths. The cut ends shall be dressed square and to a smooth even finish which shall not be inferior to that of the ends of uncut pipes. The finished dimensions of ends cut at Site must be within the tolerances applicable to the ends of the particular types of pipe to be laid. The cost of cutting and trimming pipes shall be included in the rates tendered for laying and jointing pipes. In addition, GRP pipes shall be cut, bevelled and sealed strictly in accordance with manufacturer's instructions

PSL 5.3 SETTING OF VALVES, SPECIALS AND FITTINGS

ADD THE FOLLOWING TO THIS SUB-CLAUSE:

"Valves shall be jointed such as to remain operative when the downstream pipe is removed.

All valves shall be placed as and where indicated on the drawing."

Add to the Sub-Clause:

Valves are to be set correctly in the positions indicated and supported on concrete stools, except where not so required by the Engineer. Valve spindle guide brackets and stays where provided shall be secured into position against concrete work and set and carefully adjusted in order to give true vertical alignment of the spindle.

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Contractor

Witness 1

Witness 2

PSL 5.10 Disinfection of Potable Water Pipelines

Add to the Sub-Clause:

Disinfection shall be carried out by the Contractor until tests carried out indicate that the water main has been adequately disinfected to achieve the residual chlorine standard normally adopted by the Employer.

PSL 6 TOLERANCES

PSL 6.2 ALIGNMENT (PLAN AND LEVEL)

DELETE CLAUSE 6.3 AND REPLACE WITH:

"The permissible deviation in plan and level alignment from the designated line of the pipeline shall be $\pm 20\text{mm}$ and $\pm 10\text{mm}$ respectively provided always that the rate of departure from the designated line nowhere exceeds 1 in 600."

PSL 7 TESTING

ADD THE FOLLOWING SUB-CLAUSES:

PSL 7.1.1 Inspection (Additional Clause 7.1.1 under 7.1)

"The Contractor shall be responsible for supplying pipes and specials which comply with the specification in every way and he shall arrange for such inspection of his own work as well as work done by others as may be necessary to ensure this.

All welded steel items shall receive a 100% visual inspection of all welds after they have been cleaned and all visible defects shall be rectified.

The Employer reserves the right to appoint suitable qualified inspectors to inspect all stages of the manufacturing process in the Contractor's workshop and in those of his suppliers, on either a part time or a full-time basis. The Contractor shall have no claim for moderate inconvenience due to the inspection procedure."

PSL 7.1.2 Standard of Acceptance (Additional Clause 7.1.2 under 7.1)

"The Standard of acceptance of welding shall be laid down in API 1104: Standard for welding pipelines and related facilities, for API 5L line pipe."

PSL 7.1.3 Marking (Additional Clause 7.1.3 under 7.1)

"All individual pipe fillings and pipe specials shall be clearly marked with the appropriate reference numbers for identifying purposes. Reference numbers shall be legibly painted and also stamped on the one end of each pipework item.

The position of a weld test shall be clearly recorded and related to a pipe number."

PSL 7.2 INITIAL TESTS ON WELDING STEEL PIPES

PSL 7.2.1 Dye-Penetrant Test

ADD THE FOLLOWING TO THIS SUB-CLAUSE:

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"The Contractor shall perform non-destructive testing on complete welds being not less than 10% of the total welding performed, in addition to every weld for steel specials."

PSL 7.2.2 Radiographic Examination

ADD THE FOLLOWING SUB-CLAUSES:

"Testing for X-ray examination shall be carried out as specified in BS 2600: Methods of Radiographic Examination of Fusion Welded Butt Welds in Steel.

The Contractor shall allow for X-ray tests on 1% of all welds performed by an automatic process and on 2½% of all welds performed manually or by a semi-automatic process. The cost of this work shall be deemed to have been included in the rates for steel pipes and specials.

Testing for ultrasonic examination shall be carried out as specified in BS 3923, 1968, Part 1: Manual Examination of Fusion Welded Butt Joints in Ferritic Steel."

PSL 7.2.3 Magnetic Particle Examination (Additional Clause after 7.2.2)

"Testing shall be carried out to BS EN 1291:1998, Methods of Magnetic Particle Testing of Welds."

PSL 7.2.4 Paraffin Test (Additional Clause after 7.2.2)

"All fabricated steel bends, fittings and specials which cannot readily be pressured tested in the works shall receive a paraffin test on all welds to ensure that they are completely watertight. Alternatively, other liquid penetrants may be used."

PSL 7.2.5 Destructive Tests (Additional Clause after 7.2.2)

"The Engineer receives the right to call on the Contractor to perform destructive tests such as transverse tensile, root bend and flatter tests on test specimens cut from the pipes. Separate payment will be made for such tests if they are called for, but the Contractor shall accept that the cutting out of a specimen and its testing may cause a moderate disruption of his work."

PSL 8 MEASUREMENT AND PAYMENT

PSL 8.1 GENERAL

ADD THE FOLLOWING:

"The lining and coating of all pipes, specials and fittings shall be included in the price per unit of complete item. The painting of all pipes, valves, etc. shall be included in the price per unit of the complete item.

The corrosion protection of all underground welded pipes, fittings, flanges, flange adapters and flexible couplings, etc., shall be included in the price per unit of complete item.

All equipment and sealing mechanisms to undertake the hydraulic pipe testing shall be included in the rates for the supply and installation of the pipes and fittings.

The cost of preparing, for jointing, the ends of all new pipes, be they cut or not, shall be included in the rates."

PSL 8.2.13 VALVE AND HYDRANT CHAMBERS, ETC.

ADD THE FOLLOWING:

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“Rates shall include fully for all labour, materials and equipment to construct the chambers complete, including all specials, i.e. steel section pieces, air valves, shut-off valves, access manholes, step irons, etc. as per the drawings and shall be applicable for all diameters as indicated in the Bill of Quantities and drawings.”

ADDITIONAL CLAUSE AFTER 8.2.15:

PSL 8.2.17 Pipeline Markers

ADDITIONAL CLAUSE AFTER 8.2.15:

“.01 Concrete Pipeline Markers.....Unit: No.

The unit of measurement shall be the number of pipeline markers.

Rates shall include fully for all labour, materials and equipment required to construct the precast concrete markers as well as the transport and installation of the markers. The concrete markers shall be 10MPa/19mm Concrete and shall be a minimum height of 1,000mm.”

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Contractor

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PSLB: BEDDING (PIPES)
(Applicable to SANS 1200 LB)

PSLB **DEFINITIONS**

PSLB 2.3 **BEDDING**

The classes of bedding applicable to this contract shall be Class C bedding for rigid pipes in verges, servitudes and parks and Class A bedding under roadways. For flexible pipes it shall be as specified in Sub-clause 3.3 of SANS 1200 LB.

uPVC and polyethylene pipes will per definition be "flexible pipe". All other pipes will per definition be "rigid pipe".

PSLB 3 **MATERIALS**

PSLB 3.1 **Selected Granular Material**

Delete the Sub-Clause and substitute:

SELECTED GRANULAR MATERIAL. Selected granular material shall be a granular material with a PI not exceeding 10, grading modulus not less than 1.2, free from lumps or stones retained on a 19 mm sieve and having a compatibility factor (as determined by the test given in Section LB of Part 3 of SABS 0120) not exceeding 0,4.

PSLB 3.2 **Selected Fill Material**

Delete the wording of this Sub-Clause and substitute:

SELECTED FILL MATERIAL. Selected fill material shall be material with PI not exceeding 12 and that is free from vegetation and from lumps or stones of diameter exceeding 30 mm.

PSLB 3.3 **Bedding**

Add to the Sub-Clause:

All pipes laid under this Contract will be considered as being rigid pipes and the bedding shall be of Class A, B or C (Drawing LB-1) as applicable and scheduled except that joint holes (pockets) shall be provided in the bedding, as per Drawing LB-2, at each pipe joint and coupling. No sharp-edged stones shall be allowed to come into contact with either the pipes or the couplings (joints). No extra payment will be made for forming joint holes (pockets).

PSLB 3.4 **SELECTION**

PSLB 3.4.1 **Suitable Material available from Trench Excavation**

REPLACE THE WORDS

"(but is not required)"

IN THE FIFTH LINE WITH THE WORDS

"(at his own cost)".

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PSLB 5 CONSTRUCTION

PSLB 5.1 GENERAL

PSLB 5.1.3 Placing

ADD THE FOLLOWING TO SUB-CLAUSE 5.1.3.4:

Backfilling up to 300 mm above the top of the pipe shall be carried out immediately the pipes have been laid and shall be completed before the acceptance test is carried out except at joints which shall be left exposed until the pipeline has been satisfactorily tested.

PSLB 5.2 Placing and Compacting Rigid Pipes

PSLB 5.2.1 Class 'A' Bedding

Delete the first sentence of 5.2.1(a) and substitute the following:

The pipes shall be supported on a continuous cradle of grade 20/19 concrete.

PSLB 5.2.2 Class B and C Beddings

Delete the third, fourth and portion of the fifth lines up to the words "as relevant" and substitute the following:

The pipes shall be bedded on a continuous mound of selected granular material. The remainder of the bedding shall be placed in layers under the overhang and up the sides of the pipe, each layer being compacted until levels are reached.

PSLB 5.2.5 Stone Bedding

Add new Sub-Clause:

Where ordered by the Engineer, special drains consisting of a 150 mm thickness (See PSDB 5.1.2.2) of 6 mm to 20 mm graded stone extending the full width of the trench shall be provided below the bedding to the pipes. The excavation for these drains will be measured in cubic metres at the contract rate applying to unsuitable excavation below the bottom of the trench. The stone filling will be paid for per cubic metre. All measurements in this connection will be to a width equal to the base widths and depths ordered.

PSLB 5.3(b) Selected Fill Blanket

Delete "200 mm" from title.

PSLB 5.4 Concrete Casing to Pipes

Add to the Sub-Clause:

Where concrete casing is ordered by the Engineer it is to be of grade 20/19 concrete with a minimum thickness of 150 mm above the top of the pipe.

PSLB 5.5 Soilcrete

Where ordered by the Engineer or where shown on the drawings, pipes shall be backfilled using Soilcrete. Soilcrete shall consist of an approved soil or gravel mixed with 5% by weight of cement and only sufficient water to give it a consistency that will permit the Soilcrete to be placed, using vibrators, tampers and other approved methods, in such a way that all voids between pipes and sides of excavations and between pipes in the case of

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multiple installations, are properly filled. The height to which the Soilcrete backfill shall be taken shall be as determined by the Engineer or as shown on the drawings.

The aggregate used for Soilcrete shall preferably be a sandy material but may contain larger particles up to 38 mm and it shall have a plasticity index of not more than 10. Detrimental percentages of silt or clay must be avoided, and the aggregate shall be obtained from an approved source.

The Soilcrete shall be mixed on site using suitable concrete mixers and water and cement contents shall be carefully controlled. The material shall be placed and then thoroughly compacted by means of concrete vibrators; tampers or other approved methods, so that all voids are filled as described above. Stones shall be packed at the pipe ends to prevent the Soilcrete from flowing outside the required limits.

PSLB 6 TOLERANCES

PSLB 6.1 Moisture Content and Density

Add to the Sub-Clause:

The permissible deviations applicable are to be those for Degree of Accuracy II class of work.

PSLB 8 MEASUREMENT AND PAYMENT

PSLB-8.1 PRINCIPLES

PSLB-8.1.3 Volume of bedding materials

ADD THE FOLLOWING:

"By means of the clarification of the specification, the volume displaced by the pipe will not be paid for."

PSLB-8.1.5 Disposal of displaced material

REPLACE THE CONTENTS OF THIS SUB CLAUSE WITH THE FOLLOWING:

"Material displaced by the pipeline and by imported material from sources other than trench excavation, shall be disposed of at an approved site furnished by the Contractor. No haulage is payable for such material."

PSLB-8.2 SCHEDULED ITEMS

PSLB 8.2.1 Provision of Bedding from Trench Excavation

Delete the Sub-Clause and substitute:

No payment will be made for the provision of bedding materials which complies with the specification where such material is available from trench excavations within 15 m of the point where it is required.

Provide bedding without the need for screening:

- | | | |
|----|----------------------------|----------------------|
| a) | Selected granular material | Unit: m ³ |
| b) | Selected fill material | Unit: m ³ |

The rates shall cover the cost of acquiring, from any point as may be selected by the Engineers beyond 15 m but within 2,0 km, bedding that complies with the relevant requirements of the specification, or which after screening

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will comply with the specification, of delivering it to points alongside the trench spaced to suit the Contractor's methods of working, of making good any backfill deficiency from points where backfill has been acquired, and of disposing of displaced material within the free haul material.

The free haul distance for transporting bedding materials and for disposal of surplus material shall be 2,0 km.

PSLB 8.2.1.1 Screening Material for Bedding

Add the following Sub-Clause:

Screening material for bedding:

- | | | |
|----|----------------------------|----------|
| a) | Selected granular material | Unit: m³ |
| b) | Selected fill material | Unit: m³ |

The rates for screening shall cover the extra-over cost for screening (where so ordered by the Engineer) material obtained and paid for in accordance with PSL 8.2.1 above to obtain bedding material as specified.

PSLB-8.2.2.2 Supply of bedding by importation from Borrow Pits

ADD THE FOLLOWING:

"The tendered rates shall also cover the costs of sufficient tests to ensure that material to specification is selected and for the selection process itself, inclusive of sieving the material."

PSLC: CABLE DUCTS

(Applicable to SANS 1200 LC - 1981)

PSLC 2 INTERPRETATIONS

PSLC 2.4 Abbreviations

Delete the words "GPO: Department of Post and Telecommunications" and insert the words "Telkom: Telkom SA Limited".

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PSLC 3 MATERIALS

PSLC 3.1 Ducts

Add the following:

The Contractor shall use the materials supplied to him by Telkom in the most economical manner. Materials lost or damaged through neglect on the part of the Contractor or his workmen shall be made good by the Contractor, or the value thereof will be deducted from any monies due to him.

The Contractor shall cart all materials supplied by Telkom to the place of work and shall, on completion of the work, return all surplus material to Telkom.

PSLC 3.1(e) Split UPVC Pipes

Add new Sub-Paragraph:

Split pipes shall only be used to provide ducts for existing services which cannot be severed or threaded through the ducts. The pipes shall be accurately cut in the middle and opposite halves shall be matched as sawn. Split pipes shall be placed around the service, firmly bound by stainless steel straps, and finally backfilled or encased in concrete as required by the drawings.

PSLC 3.2.1 Bedding for Electricity Supply Cable Ducts

Delete from the second line "PI not exceeding 6" and substitute "PI not exceeding 12".

PSLC 3.2.2 Bedding for Telephone Cable Ducts

Delete from the second line:

"or crusher run graded from 13,2 mm to dust."

PSLC 3.3 Backfill

Delete the wording of this Sub-Clause and substitute:

Material to be used for backfilling shall be sub-base quality material complying with the requirements of Clause 3.2.1 of SANS 1200 ME and shall be compacted to a minimum of 90% of modified AASHTO density. At road crossings the ducts shall be encased in concrete or in Soilcrete as specified in PS LB 5.5 or as instructed by the Engineer.

PSLC 3.4 Cable Duct Markers

Notwithstanding the provisions of the Sub-Clause, telephone cable duct markers shall be as detailed on the drawings. The rates shall be held to cover for the supply, additional excavation, installation including tying to draw wires and backfilling.

PSLC 3.5 Materials Provided by Telkom

Add new Sub-Clause:

When material, such as 100 mm dia. pitch-fibre pipes, 2,50 mm dia. copper screening wire and 3,05 mm dia. galvanized iron draw wire is supplied and delivered, free of charge to site by Telkom it will be done so against a receipt signed by a responsible representative of the Contractor.

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The Contractor shall inform the official of Telkom delegated to handle this matter at least two weeks prior to the date on which pipes are required.

The Contractor shall use materials supplied to him in the most economical manner possible. Materials lost or damaged through neglect or accident on the part of the Contractor or his workmen shall be replaced by the Contractor at his own expense.

All materials and equipment handed to the Contractor shall be insured against damage or loss as stipulated under Clause 35 of the General Conditions of Contract, 1st Edition, 2004.

The Contractor shall on completion of the work, deliver any surplus material which has been issued to him, to the nearest Telkom engineering yard.

PSLC 5 CONSTRUCTION

PSLC 5.1.1 Trench Widths and Depths

Delete Sub-Paragraph 5.1.1.2(a) and substitute:

- a) "The trenches in which ducts are to be laid shall have a depth sufficient to provide a minimum cover of 600 mm between the top of the uppermost duct and the finished road surface level. Where this depth cannot be maintained owing to the nature of the ground, the depth may be varied at the discretion of the Telkom Engineer. In all cases where a duct has less cover than 600 mm it shall be covered by means of precast concrete slabs having a minimum thickness of 50 mm and a width equal to 400 mm plus the diameter of the duct it protects, except where otherwise directed by the Telkom Engineer. The concrete slabs shall be provided by the Contractor."

PSLC 5.3.1 Straight Laying

Add to the Sub-Clause:

"The base of the trench shall slope in order that water may drain from the ducts. The longitudinal gradient of the bottom of the trench shall be at least 75 mm per 30 m of cable duct run."

PSLC 5.3.3 Draw Wire

Add to Sub-Clause:

"A length of 3,05 mm dia. galvanized iron wire (supplied by Telkom) shall be attached to the cleaning brush end and drawn into the duct and left in place for use as a draw wire. A surplus length of wire, at least 2 m neatly coiled, shall be left at each end of each length of ducting. All open pipe ends must be plugged to prevent the ingress of dirt."

PSLC 5.3.5 Jointing of Pitch-Fibre Pipes (Compulsory for Telkom Ducts)

Add new Sub-Clause:

Pitch-fibre pipes which have tapered ends shall be joined using tapered socket couplings. The pipe end and the inner surface of the coupling shall be clean before the spigot is pushed into the socket.

The end of the first pipe to be placed in a trench shall be butted firmly against a solid object to ensure that hammer blows applied to subsequent couplings will drive sockets firmly onto tapered pipe ends without causing displacement of previously laid cable ducting. Joints will be made by using a 1,8 kg hammer and a wood block (230 mm x 175 mm x 50 mm) held flush against the open end of the coupling. The end of the next pipe length shall be inserted into the coupling and a further coupling placed over its leading end. This pipe and coupling shall

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then be tapped home and the process repeated throughout the length of the line. In general, the pipe shall not enter further into the socket than 6 mm beyond hand tightness.

The Contractor shall be responsible for any necessary cutting of pitch-fibre ducts to suit the requirements of the work. Pipes shall be cut to length using a sharp coarse-toothed saw. The Contractor shall re-machine and taper the cut ends of pitch-fibre pipes with an approved hand turning machine.

PSLC 5.3.6 Screening

Add new Sub-Clause

Pipe runs shall be screened against electrical interference by copper wires with all joints made by soldering. The screen shall consist of two strands of 2,50 mm diameter copper wire, bound together by two turns of similar copper wire every 5 m. The binding shall be undertaken by the Contractor. The screen shall be placed approximately 200 mm above the duct, or the uppermost duct where there is more than one.

PSLC 5.6 Laying of Cables with Other Services

Add to the Sub-Clause:

"For telephone cables the following will apply:

The trench shall be excavated in such a position that pipes can be laid at least 300 mm from any adjacent power cables. Where this is not possible, pipes shall be separated from power cables by concrete slabs or paving slabs placed vertically."

PSLC 5.7 Crossing of Telephone and Electricity Cable Ducts

Delete the second sentence of Sub-Clause and substitute:

"Where a duct will cross an existing service such as an electricity supply cable, a water supply pipe or a sewer, the telecommunication duct shall be laid with not less than 25 mm clearance above the other service. Where the depth of the existing service is insufficient for this to be done, the telecommunication cable pipe shall be laid to pass with not less than 25 mm clearance below the other service.

PSLC 5.10 Positions to be marked

Delete from the third line the words:

"... painted by means of an approved stencil with red paint"

and replace with:

"..engraved by an approved method".

PSLC 7 TESTING

PSLC 7.1 Access for Engineer

Add the following to the Sub-Clause:

"The Telkom Engineer shall have free access to the site at all times. He shall have the power to inspect work under the Contract at any stage and may reject any part which has not been executed in an approved, substantial, workmanlike manner and in accordance with the specifications.

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No ducts shall be covered before inspection and approval by the Telkom Engineer. Arrangements shall be made by telephoning the designated official at least 24 hours prior to the required inspection.

PSLC 7.4 Final Inspection

Add new Sub-Clause:

On completion of the work a final inspection will be undertaken. The Contractor shall at his own cost expose all ends of duct runs prior to final inspection of the ducts, after which the exposed ends shall be finally closed.

PSLC 8 MEASUREMENT AND PAYMENT

PSLC 8.2.5 Supply, Lay, Bed and Prove Duct

Delete paragraphs a) and b) in their entirety and substitute:

a) For Telkom ducts, the cost of collecting all materials provided by the Telkom, the provision of any other necessary material, laying the ducts and screening wire, inserting the draw wire, jointing, bedding, and proving, all as specified

and

b) for all other ducts, as for a) above but including the cost of provision of all materials by the Contractor".

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

PSLD: SEWERS

(Applicable to SANS 1200 LD)

PSLD 3 MATERIALS

PSLD 3.1 **PIPES, FITTINGS AND JOINTS** (Sub-clause 3.1.5)

The following types of sewer pipes and fittings will be acceptable for this contract:

- a) uPVC pipes to SANS 791, with PVC fittings.
- b) Steel pipes. All steel pipes to comply to SANS 62 and SANS 719 with Fusion Bonded Epoxy Powder Coatings not less than 250 microns; for all exposed steel surfaces, all cutting edges, welding joints, etc. Steel pipes to be joined by flanges or Maxifit, Quickfit or Maxidaptor by Viking Johnson as indicated on the pipe schedule. All joints between pipes must include for all bolts, nuts, gaskets, etc. all complete.

PSLD 5.6 **MANHOLES, CHAMBERS ETC**

PSLD 5.6.1 **Precast concrete sections**

Precast concrete sections shall be manufactured from dolomitic aggregate.

Where concrete is in contact with Wastewater, dolomitic aggregates shall be used.

Manholes shall be constructed to the requirements and details as shown on Drawing LD-5 and LD-3 of SANS 1200LD.

PSLD 5.6.4 **Brick manholes**

The use of brickworks for manhole walls will be permitted only if the bricks used comply strictly with SANS 1200 LD.

PSLD 5.6.6 **Bedding and infiltration at manholes**

Where infiltration is likely in a deep manhole because of a high-water table, the Engineer may direct the Contractor to provide granular bedding around the outside of the manhole.

PSLD 7 TESTING

PSLD 7.1 **TESTING OF SEWERS**

Notwithstanding the provisions of Sub-clause 7.1.2, testing of a sewer shall only be done on completion of the backfilling and after the construction of the manholes at both ends of the line.

The Contractor may nevertheless carry out any testing which he deems necessary, before or during the backfilling operation. The pipeline will be visually inspected by the Engineer with the aid of a light and mirrors, before the required air test is applied. When examining the sewer in this way, a full circle must be visible at the far end of the pipeline and the pipeline must be thoroughly clean, with no soil, stones, mud, water or other undesirable material present in it. Before carrying out this inspection, the Engineer is entitled to request that a pull-through of 5mm diameter smaller than the pipeline, be drawn through the pipe, without any resistance whatsoever being felt throughout the length of the pipeline.

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The Contractor shall supply all the equipment required for testing the pipelines at his own cost. This equipment shall be to the Engineer's satisfaction.

PSLD 7.2.6 Watertightness of Manholes

Add to the Sub-Clause:

Wherever practicable, after each manhole has been inspected and approved by the Engineer, it is to be tested in his presence or in the presence of his authorised representative, in the following manner:

All sewer inlets and outlets to and from the manhole shall be closed with expanding plugs or other apparatus. Water is then to be introduced into the manhole up to a level 25 mm below the underside of the roof slab. The water level is to be maintained for not less than one hour or such longer period as may be necessary to accurately record the rate of leakage, if any. Careful and accurate records shall be kept at frequent and regular intervals of the variation in the level of the water in the manhole and of the quantity of water added so that the rate of leakage may be properly determined. In the event of the rate of leakage exceeding 1,25 l per hour per metre of depth of manhole, or in the event of any weakness, defect or fracture or visible signs of leakage occurring in the manhole under test, the Engineer shall have the right to order the test to be discontinued. The Contractor shall thereupon, at his own expense, search for and rectify any weakness or defect in the manhole. Such work or rectification is to consist of repair or replacement or both. The manhole shall thereafter be refilled with water and retested in the manner specified. This process shall be repeated until a satisfactory test is obtained.

The Contractor will be paid for the hydraulic testing of manholes at the rate per manhole to be quoted by him in the Schedule of Quantities. The Contractor's prices for the hydraulic testing of manholes shall include for all arrangements for the supply of water for testing, the cost of water so used where the water is not obtained free of cost from the Employer, for any necessary rectification work and retesting and for all labour, plant and materials required to carry out the specified tests.

PSLD 8 MEASUREMENT AND PAYMENT

PSLD 8.2.3 Manholes (Sub-clause 8.2.3 and 8.2.5)

The additional excavation and bedding material around the manhole, including backfill and dispose of surplus material, will be covered in the rate per manhole.

PSLD 8.2.7 Joints in concrete encasements

The rate for encasement for pipes in concrete shall include for the cost of a flexible joints at pipe collars.

PSLE: STORM WATER DRAINAGE

(Applicable to SANS 1200 LE-1982)

PSLE 3 MATERIALS

PSLE 3.1 a) Precast Concrete Pipes

Delete the Sub-Clause and substitute:

Concrete pipes shall be of reinforced concrete and shall comply with SABS 677 and be of the class as indicated on the drawings or tabulated in the Schedule of Quantities. Unless otherwise indicated they shall have ogee joints

b) Portal and Rectangular Precast Concrete Culvert Units

Add to the Sub-Clause:

Design calculations shall be submitted to the Engineer for approval before precast culverts are manufactured.

c) Skewed Ends

Add to the Sub-Clause:

Wherever required skew ends shall be cut on Site and an approved epoxy coating shall be applied to the cut ends immediately after cutting.

d) Pipes for Subsoil Drains

Add new Sub-Clause:

Pipes for subsoil drains shall have the scheduled internal diameter, which shall not be less than 100 mm.

The size of the perforations in perforated pipes shall in all cases be 8 mm $\pm$ 1,5 mm diameter and the number of perforations per metre shall not be less than 26 for 100 mm pipe and 52 for 150 mm pipe. Perforations shall be spaced in two rows for 100 mm pipes and four rows for 150 mm pipes, except where shown otherwise on the drawings.

Slotted pipes shall have a slot width of 8 mm with a tolerance of 1,5 mm in width. The arrangement of slots shall be to the Engineer's approval, but the total slot area shall not be less than specified above for perforations."

PSLE 3.4.1 Bricks

Add to the Sub-Clause:

Cement bricks complying with the relevant requirements of SABS 1215 bricks shall be considered as being acceptable.

Employer

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Witness 2

Contractor

Witness 1

Witness 2

PSLE 5.2.2 Pipe Culverts

Add to the Sub-Clause:

The bedding for storm water pipes shall be to the requirements for Class C bedding of SANS 1200 LB (Bedding).

PSLE 5.2.3 Concrete Casing of Pipelines

In second line of the Sub-Clause substitute "grade 15/19" for "mix 15".

PSLE 5.2.5 (c) Portal and Rectangular Culverts

In fifth line add "300 mm wide" between "blanket" and "placed".

In the seventh line substitute "grade 10/38" for "mix 10".

PSLE 5.4.2 Portal and Rectangular Sections

In the sixth line of the Sub-Clause substitute "93%" for "90%".

PSLE 5.5.3 Plaster

Preface the Sub-Clause with the following sentence:

All catch pits are to be constructed in brick and plastered internally.

In fourth line substitute "wooden trowel" for "steel trowel".

PSLE 5.6 Culverts on Steep Gradients

In fourth line substitute "grade 10/38" for "mix 10" and in seventh line substitute "grade 15/19" for "mix 15".

PSLE 5.8 Open Drains

Add new Sub-Clause:

Open drains are to be constructed to the details shown on the drawings, or as directed by the Engineer, to the correct line, level and cross-section. The material excavated from open drains is to be wasted to spoil.

Measurement of open drain excavation shall be calculated from natural ground level or, in the case of drains within a road reserve, from the reduced level in the road excavation, and payment will be made on a rate per m³ basis irrespective of depth. The rate is to include for all work required to trim the drain(s) to the correct line and level.

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Contractor

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PSLE 5.9 Stone Pitching

Add new Sub-clause:

Where ordered by the Engineer, open drains, storm water outlets, etc., shall be pitched with stone. Stone for pitching shall be of good, sound, durable rock of good shape and face, with a minimum size of 100 x 100 x 75 mm deep. Before pitching is commenced, all slopes and surfaces to receive pitching shall be carefully trimmed and dressed to the correct lines and grades. The pitching stones are to be laid with joints broken as much as possible and are to be hammered solid into position to present a regular and uniform surface. All joints are to be grouted to their full depth in 4:1 sand/cement mortar.

Payment for stone pitching will be made at a rate per unit finished area and the rate is to include for all trimming and dressing of the excavation, laying of the stones and grouting of the joints. Unit: m²

PSLE 5.10 Cutting of Pipes

Add new Sub-Clause:

As far as is possible culvert lengths shall be such that pipe units need not be cut. Should any straight or skew cuts be necessary, such cutting will not be measured and paid for separately in terms of Sub-Clause 8.2.4 since all additional work required in cutting the pipes as well as the wasted pipe ends shall be regarded as being included in the payment for the supply, lay, joint, bed and test of the relevant pipe culverts, as per Sub-Clause 8.2.1.

PSLE 8 MEASUREMENT AND PAYMENT

PSLE 8.2.1 Supply and Lay Concrete Pipe Culverts (Sub-Clause 8.2.1)

Delete the title of the Sub-Clause and substitute:

Supply, Lay, Joint, Bed and Test Pipelines

Add to the Sub-Clause:

The bedding shall be Class C.

Add to the Sub-Clause:

The rates shall cover the cost of providing the pipes as well as the cost of laying, bedding, jointing, making connections into manholes and testing the pipeline.

PSLE 8.2.8 Supply and Install Manholes, Catch pits and the like

Unit : No

Substitute LE 8.2.8 with the following:

The unit of measurement shall be the number of each, in the depth increments as scheduled, fully installed in accordance with the details shown on the drawings.

The rate shall cover the cost of excavating and backfilling with approved selected material from site borrow pits, stockpile or commercial sources, compacted to 93 % of MOD AASHTO density (100 % for sand), supplying and installing of all material accessories, inlet kerbs and the channel adjacent thereto as well as for the removal and spoil of all surplus material. The rate shall also include the connection of pipes to manholes, catch pits, etc. and of building pipes into the walls of such structures, but no for the cutting of skewed ends.

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Contractor

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PSLE8.2.14 Supply and Install Subsurface Drains According to Drawings Unit: m

The length shall be measurement on the centre line of the completed subsurface drain.

The rate shall cover the cost of supplying, transporting, off-loading and installing all materials as well as for cutting, wasting, overlapping and installing of the materials where applicable.

PSLE8.2.15 Connecting Subsurface Drains to Manholes, Headwalls etc. Unit: No

The number is the number of subsurface drainpipes built in at manholes, headwalls or wing walls.

The rate shall cover the cost of all labour, plant and materials necessary to connect the subsurface drain to manholes and/or kerb inlets, and making the structure watertight, all as shown on the drawings.

PSM: ROADS (GENERAL)
(Applicable to SANS 1200 M)

PSM 3 MATERIALS

PSM 3.2 SOURCE OF MATERIALS (Sub-clause 3.2)

The Contractor shall be responsible to locate suitable sources for materials for the purpose of the Contract.

PSME: SUB-BASE
(Applicable to SANS 1200 ME)

PSME 3 MATERIALS

PSME 3.2.1 Sub-base materials

The requirements for sub-base materials shall be as set out in Section 3 SANS 1200 ME except as revised by the following:

- (a) Maximum PI after stabilization – 6
- (b) Minimum CBR:

	AS MATERIAL	SUB-BASE	IN LIEU OF BASE COURSE
Before stabilization	30		45
After stabilization	45		70
Stabilizing agent: Roadlime to SANS 824 (expected application rate -2%)			

PSME 3.3.2 Gravel shoulder and gravel wearing course material

The PI shall not be left unfixed.

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Witness 1

Witness 2

Contractor

Witness 1

Witness 2

PSME 3.5 Selection (Sub-clause 3.5)

The natural gravel shall be obtained from either excavations in the road prism or from borrow pits in the vicinity of the Site.

This material shall also be used where indicated in lieu of the base course. The material obtained in the road prism shall be excavated either by cut the windrow or by cut and transport to temporary stockpile within the free haul distance.

Material obtained from borrow pits shall be stockpiled at the borrow pit ready for loading and transport.

PSME 5.4 PLACING AND COMPACTION

PSME 5.4.4.2 Compaction

The material shall be compacted to 93% or 95% Mod. AASHTO maximum density as indicated on drawings.

PSME 6 TOLERANCES

PSME 6.1.2 Grade

When the sub-base material is used in lieu of base course, particular care shall be taken in compacting and finishing the surface and preparing it for priming. The requirements of the SANS 1200 MF are required before construction of the sub-base can start.

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

PSMF: BASE
(Applicable to SANS 1200 MF)

PSMF 3 MATERIALS

PSMF 3.1 Natural gravel

Natural gravel shall be used for base materials obtained from borrow pits located by the Contractor and approved by the Engineer. The minimum CBR requirements will be as per PSME 1.1 for base materials.

The grading Reactors shall not be less than 1,75. All other requirements shall be as per Clause 3.3.1.

PSMF 5.4.1 Placing

Delete the Sub-Clause and substitute:

"Before construction of the base is commenced, the Contractor shall ensure that the:

- a) Underlying layer on which the base is to be constructed complies with the requirements of the Specification for that layer; and
- b) The kerbing and channelling shall have been completed and approved by the Engineer.

All cast in situ mountable kerbing, channelling, vehicle entrances, transitions, etc., shall have been laid for a period of at least 72 hours before construction of the base course is commenced."

Where a nominal thickness exceeding 150 mm has been specified, the base shall be constructed in approximately equal layers not exceeding 150 mm each.

PSMF 5.4.4 Compaction

Delete paragraph 5.4.4.2 and substitute:

"In the case of natural gravels compaction shall be to 98% of Modified AASHTO maximum density and in the case of graded crushed stone and graded crushed stone with fines to 86% of apparent density, or such other density as may be indicated in the Schedule of Quantities.

Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2
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PSMK: KERBING AND CHANNELLING
(Applicable to SANS 1200 MK - 1983)

PSMK 3 MATERIALS

PSMK 3.2.1 Precast Kerbing and Channelling

Add to the Sub-Clause

"Notwithstanding anything to the contrary in the Specifications or in the Schedule of Quantities, all barrier kerbs and semi-barrier kerbs shall be precast kerbs except for curved kerbs where the radius is less than 1 m."

PSMK 3.9 Bedding Material

Delete the Sub-Clause and substitute:

"The material on which the precast concrete kerbs and channels are bedded shall consist of a 1 to 8 cement sand mix, or 15 MPa concrete with 13 mm aggregate, where the layer is more than 30 mm thick."

PSMK 5 CONSTRUCTION

PSMK 5.1 Excavation and Bedding

Delete the first paragraph and substitute:

"Kerbing and channelling shall be constructed on the completed road sub-base layers."

PSMK 5.2 Precast Concrete Kerbing and Channelling

Delete the last paragraph of this Sub-Clause and substitute:

"After the grouting of kerb joints has been completed, the kerbs shall be backed with a well-punned 15MPa concrete backing to the dimensions as shown on the drawings. On curves of radius less than 20 metres, the concrete backing shall be continuous, but on straights and curves of radius greater than 20 metres, the concrete backing shall be placed in short lengths across the joints. The backing concrete shall extend a minimum of 150 mm in each direction from the kerb joints."

PSMK 5.4 Cast-in-Situ Concrete Kerbing and Channelling

Delete the second sentence of the first paragraph of Sub-Clause 5.4 and substitute:

"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 5.8.3 Machine Placed (Extruded) Kerbing and Channelling

Delete the words "500 mm beyond as relevant" in the first paragraph of this Sub-Clause and substitute:

"150 mm beyond the back face of the kerb or edging strip."

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Witness 1

Witness 2

Contractor

Witness 1

Witness 2

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.

PSMK 8 MEASUREMENT AND PAYMENT

PSMK 8.2.1 Concrete Kerbing and Concrete Edge Beams

Delete Sub-Clause 8.2.1(b) and substitute:

- "b) The unit rate for precast kerbing and edge beams shall cover the cost of supply of all materials, bedding and backing, and for all labour for bedding, jointing, backing, excavating, compacting, testing in terms of Sub-Clause 7.2, together with all backfilling, compacting and removing of excess material."

Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2

PART A3: PARTICULAR CIVIL SPECIFICATIONS

In addition to the standardised and project specifications, the following particular civil specifications shall apply to this contract and are bound in hereafter.

PSA3 PARTICULAR CIVIL ENGINEERING SPECIFICATIONS

OTHER PARTICULAR SPECIFICATIONS:

- PA BRICKWORK, BLOCKWORK AND PLASTERING**
- PB CARPENTRY, JOINERY, TIMBERWORKS AND CEILINGS**
- PC STEEL DOORS, WINDOWS, GLAZING AND FIRE PROTECTION EQUIPMENT**
- PD PAINTING (OTHER THAN STRUCTURAL STEELWORK)**
- PE PIPELINE VALVES**

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

PARTICULAR CIVIL ENGINEERING SPECIFICATIONS

PCS 1 Exploratory Holes

Exploratory holes will be dug in soft material to a depth not exceeding 4m, where indicated by the Engineer, to determine the positions and depths of existing services.

The initial excavation may be executed by a machine, but care must be taken not to damage any buried service or structures. If services or a structure are damaged by the excavation, either by machine or hand excavation, the Contractor will carry the cost of such repairs.

Once a service or wall has been exposed, and the Engineer wish to conduct further investigations on it, further excavations required to expose the service or wall, shall be conducted by hand.

Exploratory holes will be measured as number of holes between 0 – 2m and between 2 - 4m depth and the rate shall include excavation in soft material.

Backfilling of the excavated material in layers not exceeding 150mm and compaction to a density of not less than 90% modified AASHTO will be measured separately in cubic metres of backfilled material.

PCS 2 Bulk Excavation for new Structures

Bulk excavations are required for the new Biological Reactor and the two 26m diameter Secondary Clarifiers (numbers 3 and 4). Bulk excavation in this instance is measured to the outer edge of the wall footings for each structure. The balance of excavation required for additional working space shall be considered restricted excavation and shall be measured separately under each structure.

The excavated material shall be used to fill the remainder of the sludge lagoons to a level indicated by the Engineer. It shall be determined on site which lagoon should receive preference. The excavated material shall be filled and compacted in 150mm layers to a minimum density of 90% modified AASHTO.

Measurement of bulk excavation shall be of cubic meters of material excavated in soft material. Excavation in intermediate and hard material shall be measure separately in cubic meters of excavated material and paid as an extra over to excavation in soft material.

Payment shall include transport of the excavated material on site and filling and compaction as specified.

PCS 3 Clearing and Preparation of Sludge Lagoon to be filled

Before the eastern Sludge Lagoon may be prepared to receive bulk fill material, all remaining backfilling to the western Lagoon shall be completed, to the level required for the construction of Sludge Drying Beds. All the Sludge Drying Beds designated to be built on this prepared terrace shall then first be built and the necessary pipework for the pumping of WAS from the existing works completed.

The eastern Sludge Lagoon shall then first be emptied of all remaining sludge. Sludge which are sufficiently liquid to be pumped, shall be pumped to the new Sludge Drying Beds, while the remainder of the sufficiently dewatered sludge shall be removed by machines and spread on the Sludge Drying Beds, to a depth not exceeding 300mm.

The desludged Sludge Lagoon shall now be cleared of all vegetation to a minimum depth of 100mm. The vegetation shall be stockpiled on site, where approved by the Engineer, allowed to dry and the burned under controlled conditions and under supervision.

Clearing of the lagoon shall be measured and paid as stipulated in SANS 1200C and removal of sludge on a time/cost basis.

The cutting, stockpiling, and drying of vegetation shall be measured and paid as square meter of vegetation removed.

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Contractor

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Removing liquid sludge from the Sludge Lagoon shall be measured and paid as follows:

- Supply of pump, generator, and flexible hosing as a lump sum.
- Pumping of sludge to the completed Sludge Drying beds on a time/cost basis which shall include fuel for the generator.

Removing of dewatered sludge by machine and spreading it on the Sludge Drying beds for further dewatering shall be measured and paid as cubic meters of sludge placed on the beds.

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

OTHER PARTICULAR CIVIL SPECIFICATIONS PA: BRICKWORK, BLOCKWORK AND PLASTERING

PA 1 BRICKS AND BLOCKS

PA 1.1 Burnt Clay Masonry Units

Solid clay masonry units (bricks) shall be of nominal dimensions 222 x 106 x 73 mm, unless otherwise noted, shall comply with SABS 227 and conform to the types scheduled, as selected from the following:

	Nominal Compressive Strength	Max Water Absorption
FBX - face brick extra	17 Mpa	10%
FBS - face brick standard	17 MPa	12%
NFP - non facing to be plastered	10,5 MPa	15%
NFX - non facing extra for damp conditions	14 MPa	15%

Engineering bricks shall carry the suffix 'E' and the compressive strength in MPa and shall be of one or more of the following types as scheduled:

	Max Water Absorption
FBXE 45 the best engineering brick	7%
FBSE 30 a good engineering brick	8%
NFXE 14 the lowest acceptable category	10%

Sample bricks shall be taken at random by the Engineer should he consider tests to be necessary. These tests shall normally comprise an inspection for defects, a compressive strength test and a water absorption test. Should any deficiencies become apparent after testing in according with SABS 227 the Engineer shall have the right to reject the complete consignment.

PA 1.2 Concrete Masonry Units

Concrete masonry units (blocks) shall comply with SABS 1215 and shall be either solid or hollow as called for in the Schedule of Quantities or shown on the drawings.

The preferred dimensions of units where not otherwise called for, are as follows:

Solid Units	222 x 106 x 73 mm
or	190 x 90 x 90 mm
Hollow Units	390 x 90 x 190 mm
or	390 x 190 x 190 mm

The nominal compressive strength of solid units or hollow blocks shall be at least 14 MPa except where shown otherwise on the drawings or the Schedule of Quantities. The alternative strengths shall be either 7 or 21 MPa (3,5 MPa strength is not acceptable under this Contract).

Masonry units manufactured with aggregates which contain slag, clinker or burnt clay brick shall not be used unless prior approval has been obtained from the Engineer.

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The average drying shrinkage of units shall not exceed 0,06% and the average expansion on rewetting shall not exceed 0,02% more than the actual drying shrinkage obtained from manufacturer's tests.

Sample units shall be taken at random by the Engineer, should be consider that tests are necessary to satisfy himself that there are no deficiencies in any consignment. Should deficiencies occur when tested in accordance with SABS 1215 the complete consignment may be rejected.

PA 2 BONDING OF BRICKWORK AND BLOCKWORK

PA 2.1 Brickwork Bonds

Brickwork shall be laid in stretcher bond unless otherwise noted on the drawing or scheduled to the contrary.

Cavity brickwork shall include wall ties which connect the inner and outer skins of the wall. The ties shall be galvanised and of approved pattern fixed at 5 numbers per square meter.

PA 2.2 Blockwork Bonds

Bonding of blockwork shall be carried out in full compliance with Sub-Clause 5.3.7 of SABS 0145.

PA 3 BRICKLAYING AND BLOCKLAYING

PA 3.1 Laying Clay Bricks

Brickwork shall be well and regularly bonded, with no false headers and none but whole bricks except where legitimately required as closers. All bricks must be thoroughly wetted before laying and each brick is to be pressed into its bed to squeeze out superfluous mortar and give a finished joint generally 10 mm thick, but in no case shall it exceed 12 mm thick. All joints, both horizontal and vertical, notwithstanding any trade custom to the contrary, are to be filled solid with mortar for their full width and depth, each course being flushed with mortar, worked well down into all vertical joints before the succeeding course is laid.

Horizontal and vertical joints shall be rounded, square or flush pointed as required by the Engineer. All joints of facework shall be pointed flush. Plastered walls shall have the joints raked out to a depth of 6 mm to form a key for the plaster.

Bricklaying is to be carried out uniformly so that no part of the work shall be in advance of any other part by more than six courses, unless otherwise authorised by the Engineer. In the latter case the work is to be stepped back as toothing will generally not be allowed.

The cavity in cavity walls shall be kept free from mortar droppings and movable boards of the appropriate widths shall be used for the purpose. Vertical joints in the outside leaf on the course immediately above the damp proof course shall be raked out every third brick to drain the cavity.

PA 3.2 Laying Concrete Blocks

Concrete blocks shall be laid in compliance with Code of Practice SABS 0145-1978.

Blocks shall not be wetted prior to laying in a wall and the moisture control at the time of laying shall comply with Table 2 of that Code of Practice. The drying shrinkage of the blocks to be laid shall be available to the Engineer in the form of a directive from the manufacturer of each type of masonry unit. The average annual humidity shall likewise be made available to the Engineer.

Blocks shall be laid on a full bedding of mortar. All joints are to be nominally 10 mm thick and both vertical and horizontal joints shall be filled. Blocks shall be laid with the thicker shell face outermost. They shall be laid in

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stretcher bond with the horizontal distance between vertical joints in adjacent course equal to at least one quarter of the length of the block. All blockworks shall be built true and plumb with the perpend vertically in line.

Control joints shall be formed at spacings indicated in Table 3 should joints not be detailed on the drawings. The spacing is a function of the vertical spacing of the horizontal reinforcement.

Corners and other work where the blocks are necessarily laid to a higher level than the general progress of work shall be stepped back and not raised above the level of the remaining blockwork by more than one metre.

Blocks below damp-proof course level shall be concrete filled using concrete having the same mix proportions as the concrete in the strip foundations. The concrete shall be struck off flush at damp proof course level.

Horizontal reinforcement shall be placed at 600 mm vertical spacings unless shown otherwise on the drawings and bond beams shall be incorporated in the structure as shown on the drawings.

Fire resistance ratings as shown in Table 4 of the Code of Practice shall be adhered to, if required by the drawings.

PA 4 LOUVRE VENTS AND AIR FILTERS

Where indicated on the Drawings or ordered by the Engineer, openings for louvre vents shall be formed through walls, and vents supplied by an approved manufacturer shall be fitted therein and neatly finished off.

Where indicated on the Drawings, openings shall be formed through walls for air filters and the filters, supplied by an approved manufacturer shall be joined together to form panels as shown on the drawings and fitted in accordance with the manufacturer's instructions.

PA 5 BUILDING IN PIPES, FRAMES, STEELWORK ETC

All window and door frames and wall vents are to be set up and built-in as the brickwork proceeds. Window and door frames are to be set, bedded and pointed in 4:1 sand cement mortar and the tendered unit rates are to include for any cutting and fitting of brickwork and for making good thereafter. The unit rates are also to include for attending to windows, doors and vents etc., in order to leave them in perfect working order. The Contractor will be held liable for the repair of any damage done to such items during progress of the work.

Where pipes, frames, brackets or other such parts pass through or have to be set into brickwork, the bricks shall be carefully cut and fitted around the parts so as to maintain regularity of courses and uniformity of joints, the shaped bricks being bedded and pointed to conform with the surrounding brickwork. Where such parts have to be set into position after brickwork is built, holes shall be left wherever possible, in preference to cutting out bricks, and the work shall be subsequently made good in the manner described.

PA 6 DAMP PROOFING

PA 6.1 Damp Roof Course

Where indicated on the Drawings, a damp proof course is to be embedded into the work, consisting of a bituminous sheeting of mass not less than 1,3 kg/m² or PVC sheeting of 0,375 mm thickness laid over the full width of the wall, lapped and sealed at all joints. Where shown on the Drawings, the damp proof course is to be stepped up one course of brickwork in the inner skin. Proper returns are to be made at all door frames.

Damp proof courses in blockwork shall be laid strictly in accordance with Sub-Clause 5.3.6 SABS 0145 at all places indicated in that Code or Practice.

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PA 6.2 Underfloor Waterproofing

Underfloor waterproofing membranes, where called for, shall be of 250-micron thick PVC sheeting lapped to a minimum of 200 mm at all joints.

PA 6.3 Waterproofing Blockwork Faces

Where the external faces of blockwork are not to be plastered they shall be treated with an approved waterproof coating applied in accordance with manufacturer's instructions.

PA 7 WINDOWSILLS

Windowsills shall be manufactured and installed as shown on the drawings including items such as damp-proof course and expanded metal reinforcement where called for.

PA 8 PRECAST CONCRETE LINTELS

Precast concrete lintels over doors and windows shall be supplied by an approved manufacturer and suitable for the thickness of the walls being constructed. Shoring of soffits of lintels shall be fixed on spans exceeding 2,5 m and left in place for as long as the Engineer considers necessary. The length of lintels shall be such as to give at least 200 mm of bearing at each end, unless noted otherwise.

PA 9 EXTRACTION FANS

Where indicated on the drawings, openings shall be formed through walls for extraction fans. The required fans complete with bird proof weather cowl, shall be supplied and fitted therein by an approved specialist firm. Making good around the fan unit shall be carried out by the Contractor.

PA 10 WALL CHASING

Where directed by the Engineer the Contractor shall chase brickwork to accommodate electrical conduit. Such chasing shall precede plastering or rendering and on no account shall the plastering or rendering be commenced until the conduit has been installed. The Contractor's rates for chasing shall include for making good the brickwork after the conduit has been fixed.

In the case of unplaster concrete walls electrical conduit shall either be cast into the concrete during pouring or shall be surface mounted as indicated on the drawings or in the Schedule of Quantities.

Chasing in masonry units shall be carried out in compliance with SABS 0145 and where possible, as directed by the Engineer, shall be cut prior to laying the blocks.

PA 11 CEMENT MORTAR

PA 11.1 Mortar for Brickwork

Sand for mortar shall comply with SABS 1090 and be well graded from 5 mm down in accordance with Table 1. Sand shall not contain an excess of dust or fine material. Cement shall be Portland cement Type CEM.I 42,5 to SABS ENV 197-1.

Cement mortar shall be in the proportion 1-part ordinary Portland cement to 4 parts sieved sand in the case of face brickwork, and 1 part cement to 5 parts sand for all other brickwork.

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2

PA 11.2 Mortar for Blockwork

Mortars to be used for block laying are to be in accordance with either Classes I, II or III as specified in SABS 0145 Sub-Clause 3.2.3 as called for in the Schedule of Quantities or on the drawings. Should no specific strength be specified then Class II mortar having a compressive strength of 5 MPa at 28 days shall be used. The mortar mix shall be 170 ℓ of sand to 50 kg of Portland cement 42,5 and which shall be used in conjunction with a mortar plasticizer conforming to BS 4887.

Alternatively, 50 kg of an approved masonry cement (supplied by a reputable manufacturer) may be used in lieu of 50 kg of Portland cement in the mix to give the same 28-day strength as required under the previous paragraph, but in that case no mortar plasticizer is to be used.

PA 12 REINFORCEMENT

PA 12.1 Reinforcement to Brickwork

Brick force mesh or similar approved reinforcement shall be built into brickwork where specified or shown on the drawings.

Reinforcement to brickwork shall comprise galvanised welded mesh as called for on the drawings supplied in rolls. The mesh shall be of suitable width to suit the brickwork thickness and the minimum cover from any external face shall be at least 10 mm. Reinforcement is to be built in every third course except where shown otherwise on the drawings. Except where shown to the contrary on the drawings, galvanised steel strips of dimensions 1 360 mm long x 40 mm wide x 1,6 mm thick shall be used to tie brickwork into concrete columns at every fourth course.

PA 12.2 Reinforcement to Blockwork

Reinforcement to blockwork shall comprise galvanised welded mesh supplied in rolls. The mesh shall be of suitable width to suit the blockwork thickness and the minimum cover from any external face shall be at least 20 mm. The number of courses where reinforcement is to be built in shall be at 600 mm (maximum) vertical spaces, except where shown otherwise on the drawings.

PA 13 HOOP IRON TIES AND ANCHORS

Galvanised hoop iron ties shall be provided for securing roof timbers to brick walls and shall be built-in to a vertical depth of not less than six courses of brickwork with bottom ends bent square to form an anchor. The upper ends shall project at least 450 mm above the brickwork for attachment to roof timberwork.

Anchoring of roofs and floors in blockwork shall be carried out in accordance with Sub-Clause 5.3.8 of SABS 0145 except where shown otherwise on the drawings.

PA 14 PLASTERING

Plastering shall be composed of one part Portland cement (CEM 142,5) plus one tenth part lime to four parts fine plaster sand from an approved source. An equivalent mortar comprising other cementations materials may be approved by the Engineer, after testing. Plaster shall be applied to walls in one coat 12 mm thick and well worked into brickwork or blockwork joints, which shall have been previously raked out to form a key. The surface of the work shall be finally smoothed with a wooden float or steel trowel, as may be called for, depending upon the nature of the surface required. Angles and edges are to be carefully plumbed or levelled and corners shall be arras rounded.

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Contractor

Witness 1

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In the case of plastering to concrete work, the surface of the concrete shall first be hacked sufficiently to afford proper bond and the plaster applied as a thin skimming coat, or coats. V-joints shall be formed at the junction of concrete and brickwork. Plaster adhesive supplied by a reputable manufacturer may be used on the concrete faces in lieu of hacking, subject to approval by the Engineer.

Where scheduled or shown on the drawings, the external faces of brickwork, blockwork and/or concrete shall be cement mortar plastered.

Should any plaster show signs of cracking, blowing or other defects at any time before or during the defects Liability Period, the defective work shall, either be stripped and replastered or locally repaired by the Contractor, all at his own expense, as directed by the Engineer. The defective areas shall be cut out to a rectangular shape unless otherwise permitted, with edges undercut to form a key and the joint carefully smoothed off flush with the surrounding plaster. Plasterwork should in all cases be commenced at the top and proceed downwards and every care must be taken to prevent staining of face brickwork and other finished parts with plaster droppings. Such droppings shall not be allowed to harden, but shall be cleaned off continuously as plastering proceeds. Plaster droppings in sumps must be removed to the satisfaction of the Engineer. Plastering must be carried out from ceiling to floor and from wall to wall without any breaks in the plastered surface.

PA 15 PAYMENT FOR BRICKWORK

PA 15.1 Payment for brickwork will be made by area of finished brickwork of the various thicknesses and types as scheduled, measured in elevation. Unit: m².

Prices shall be inclusive of the supply of all materials, plant, and labour necessary for completing the work including the building in of wire ties, all plumbing of corners and faces, lining, levelling, forming reveals and openings, cutting where necessary but not specially scheduled. The measurement of the work will be taken net with window and door openings deducted, but no deductions from the measurements will be made for lintels, air bricks, pipes up to and including 150 mm diameter or fittings up to 150 mm square built into the work. Small openings of area up to 0,05 m² will not be deducted.

Items for brickwork are scheduled separately for reinforced and unreinforced brickwork, except for small areas of reinforced brickwork over openings, windows and doors etc., which are deemed to be included in the rate for unreinforced brickwork.

PA 15.2 Payment for louvre vents and air filters will be made by number supplied and installed. Unit: No

PA 15.3 Payment for building in window frames, doors frames, pipes, steelwork etc. shall be paid separately for each type and size as scheduled. Unit: No

PA 15.4 Payment for damp proof course will be made by the net area of each size supplied and installed. No separate payment will be made for overlaps etc. Unit: m²

PA 15.5 Payment for lintels will be made by length installed. Unit: m

PA 15.6 Payment for extraction fans will be made by number supplied and installed. The tendered rate shall include for forming the necessary openings through the walls. Unit: No

PA 15.7 Payment for chases in brickwork for electric conduits will be made per linear metre of chase cut. Unit: m

PA 15.8 Payment for hoop iron ties will be made by number supplied and installed. Unit: No

PA 16 PAYMENT FOR BLOCKWORK

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Witness 1



Witness 2



Contractor



Witness 1



Witness 2

PA 16.1 Payment for blockwork will be made by area of finished blockwork of various thicknesses and types, measured in elevation.
Unit: m²

Prices shall be inclusive of the provision of all materials, plant and labour necessary for completing the work including the building in of wire ties, all plumbing of corners and faces, lining, levelling, forming reveals and openings, cutting where necessary and plastering where specified. The measurement of the work will be taken nett with window and door openings deducted, but no deductions from the measurements will be made for lintels, air bricks, pipes up to and including 150 mm diameter or fittings up to 150 mm square built into the work. Small openings of area up to 0,05 m² will not be deducted.

PA 16.2 Payment for infilling of blockwork with concrete shall be extra over the payment item PA 16.1 above, for various thickness and types, measured in elevation.

The rate shall include the provision of expanded metal mesh where indicated. Unit: m²

PA 16.3 Payment for waterproof coating of external faces shall be by the surface area treated.
Unit: m²

PA 17 PAYMENT FOR PLASTERING

PA 17.1 Payment for plastered finish to walls will be made by area of finished plaster, measured in elevation, for each surface finish specified. Prices shall be inclusive of the provision of all materials, plant, and labour necessary for carrying out the plastering work, including the plumbing of corners and faces and forming reveals and openings. The measurement of the work will be taken net with window and door openings deducted. Small openings of area up to 0,05 m² will not be deducted.
Unit: m²

Employer	Witness 1	Witness 2	Contractor	Witness 1	Witness 2
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OTHER PARTICULAR CIVIL SPECIFICATION PB: CARPENTRY, JOINERY, TIMBERWORK AND CEILINGS

PB 1 TREATMENT OF TIMBER

Timber shall be treated with a wood preservative to the approval of the Engineer. Proof that such treatment has been carried out shall be given to the Engineer should he so request.

Timbers not required to be treated shall, however, be treated with wood preservative where the timber is to be used in wall plates, bearers, joists and beams, and the portions thereof which are to be built into brick or concrete work.

The preservative to be used shall be covered by relevant SABS specifications and shall be to the approval of the Engineer.

PB 2 WROUGHT FACE

All exposed woodwork, unless otherwise described, is to be wrought and for each wrought face 1,5 mm will be allowed off the specified sizes. All wrought faces are to be finished smooth and free from tool marks.

PB 3 STRUCTURAL AND ENGINEERING TIMBER

All timber to be used in general structural work shall conform to the requirements of SABS 563 for stress Grade M5 with a density of at least 360 kg/m³, unless otherwise scheduled.

Where a stress grade other than M5 is called for, the timber used shall conform to SABS 1245 for engineering timber. Where reference is made to SABS 1245 for Engineering Timber, the strength grade shall be as scheduled or as shown on the drawings.

PB 4 SHRINKING, WRAPPING AND TWISTING

Should any timber member shrink or warp more than 3 mm, or twist more than 2° over its full length, the same shall be removed and new timber refixed in its place at the Contractor's expense, together with any other member which may thereby be affected.

PB 5 PREFABRICATED ROOF TRUSSES

Prefabricated timber roof trusses shall be made from South African pipe complying with PB3 above, having a stress grading of M5 and bearing the SABS mark. The joints shall be butted and joined with suitably sized "gangnail" or similar approved galvanised connector plates. Each joint shall be capable of withstanding a loading at least 50% more than that imposed by the maximum design load for the truss.

Drawings of the prefabricated trusses the Contractor proposes to use shall be submitted to the Engineer for approval in good time prior to the Contractor placing orders for such trusses. The drawings shall show the following minimum information for each type of truss required.

- a) The design span and spacing of the trusses.
- b) The overall height from underside of cross beam to apex.

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- c) An elevation of the truss showing the size of all the members, the position of the purlins and the spacing of the trusses along the line of the roof.
- d) The "gangnail" plate sizes at every joint.
- e) The type of roof covering material and the design loading.

PB 6 ROOF TIMBER WORK

PB 6.1 Bolted Roof Trusses

These trusses including the tie beams shall be made from timber having a stress grading of M5 and shall be constructed to the dimensions shown on the drawings or as scheduled. The trusses shall be strongly framed, halved, checked and bolted together in the best manner and in accordance with acceptable practice. The work is to be soundly secured and accurately lined and set to conform with the overall sizes given. The timber shall be wrought where exposed to view.

Bolts unless otherwise specified or scheduled shall be 12 mm diameter of adequate length and provided with a pair of 50 mm diameter x 2,0 mm thick circular washers.

PB 6.2 Timber Wall Plates, Purlins and Other Members

Timber roof members shall be manufactured from timber complying with PB3 above and shall be cut to the dimensions shown in the drawings, mitred and jointed where necessary. Joints in straight runs of timber shall be spliced and nailed, with the length of splice being at least 5 times the depth of the member and the nail centres equal to the depth. The number of joints shall be minimised to the satisfaction of the Engineer.

All members which are built into brickwork or blockwork and all faces of members exposed to the weather shall receive a suitable approved wood treatment.

PB 7 CEILINGS

PB 7.1 Normal Sheeted Ceilings

The underside of roof ties shall be lined with the ceiling material shown on the Drawings or as scheduled. Ceiling materials shall be nailed to the bracking with galvanised clout nails in countersunk holes and stopped with putty where not covered with cover strips. Bracking shall be of at least 38 x 38 mm square section and shall be provided at not more than 560 mm centres to suit ceiling panels and with cross bracking where required at not more than 1 200 mm centres, cut in flush at joints and side nailed. All joints in the bracking shall be scarfed joints. The ceiling panels which shall not exceed the sizes recommended by the manufacturer shall be nailed every 150 mm along the panel edges and at a distance of 10 mm in from the edge. Suitable metal strips covering the joints and returned around cornice lines shall be provided. Special serrated ceiling nails shall be used in accordance with the manufacturer's recommendations.

Ceilings shall be fitted only after completion, testing and acceptance of all electric wiring required to be laid in the roof space above, except where ordered to the contrary by the Engineer.

A trapdoor 600 x 600 mm covered, framed and supported in accordance with acceptable practice, shall be provided in the ceilings.

Formed cove cornice 55 x 55 mm shall be fixed to the ceiling, plugged to walls and neatly mitred at all corners. Coving shall extend for the full peripheral length of all ceiling to wall junctions.

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PB 7.2 Patented Ceilings

Where the ceiling shown on the drawings or schedule is of a patented type, the materials supplied, and the workmanship of fixing shall be strictly in accordance with the manufacturer's specification.

PB 7.3 Thermal Insulation to Ceilings

Thermal insulation materials shall comply with SABS 1381 and be as scheduled or as noted on the drawing. The insulation shall fully cover the total ceiling area to be insulated as indicated on the drawings.

PB 8 WOODEN DOOR FRAMES

All wooden door frames shall be manufactured from hardwood (meranti or better), rebated, and grooved if required for plaster. Hardwood quadrant fillets, neatly mitred at angles, are to be fitted around all frames where abutting on concrete or cover strips, plaster or brickwork. Door frames shall be anchored into brickwork and secured to concrete work with an approved type of anchoring or fastening, spaced at not more than 600 mm centres.

PB 9 TIMBER DOORS

PB 9.1 Hardwood Exterior Doors

Hardwood exterior doors shall be heavy duty doors, framed, ledged, braced and battened solid wood doors of meranti or similar approved hardwood manufactured in compliance with SABS 545, for Class 2 (semi-interior) exposure. The timber shall comply with SABS 1099 without any laminations and the finished door shall be 44 mm thick for use with solid timber frames. Door edges shall be of the concealed edge type.

Where steel frames are specified on the drawings or scheduled, the doors shall be 40 mm thick.

Double leaf doors shall be one way opening with rebated meeting stiles.

All exterior doors shall be of standard dimensions except where scheduled to the contrary.

PB 9.2 Interior Timber Doors

Interior timber doors shall be medium duty veneered doors in compliance with SABS 545 and suitable for Class 4 (dry interior) exposure. Door edges shall be of the concealed type.

The veneer shall be of the natural finish suitable for varnishing, except where painting of the doors is required by the drawings or Schedule of Quantities in which case the veneer shall be suitable for such painting.

All interior doors shall be of standard dimensions and 40 mm thick.

PB 10 EAVES CLADDING

Eaves shall be constructed and covered as scheduled and/or as shown on the Drawings.

PB 11 WOOD PRESERVATION

Wall plates, and other timber work to be built into or set against brickwork, shall receive two coats of an approved wood preservative on all faces which will not be exposed to view after installation. The preservation shall comply with the applicable clauses of SABS 05-1980.

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PB 12 PAYMENT FOR CARPENTRY, JOINERY, TIMBERWORK AND CEILINGS

PB 12.1 Carpentry and joinery work will be paid for in accordance with the units and rates scheduled. The Contractor is to include for all beads, fillets, stops, grounds and all rebating, tanning, grooving, housing, mortising, framing and planning and all other necessary work to complete the whole of the carpentry and joinery work in the best manner according to details on the drawings and/or Schedule of Quantities.

Unit : m
: m²
: No
: Sum

PB 12.2 Prices for timber work, where scheduled separately, shall include for all necessary working, cutting, trimmings, application of preservative to build in portions of the work, etc., and for providing all necessary cleats, spikes, bolts, nails, etc. Measurement of the various members shall be taken as that of each size of timber from which the member can be cut, taken to the nearest length of 150 mm more than the actual required length.
Unit: m

PB 12.3 Factory made roof trusses shall be paid for by the total requirements including wall plates, purlins, rafters and all associated work for each Building scheduled. Unit: Sum

PB 12.4 Prices for ceilings shall include the provision of all materials (including waste and fastenings) and for all labour and plant required to complete the ceilings as shown on the drawings.

Payment shall be made by the actual surface area of finished ceiling considering whether the ceiling plane is horizontal or sloping. Unit: m²

Payment for ceiling bandering shall be made by area of ceiling to be attached thereto but only where scheduled separately. Unit: m²

Payment for thermal insulation to ceilings shall be made on the same basis as for the ceiling and for each specified thickness of insulation layer but only where scheduled separately.
Unit: m²

Prices for coved cornices (or cover strips) shall be per linear metre. Unit: m

PB 12.5 Payment for eaves cladding shall be made on the same basis as for ceilings (see PB 12.4 above).
Unit: m²

PB 12.6 Payment for wood preservation shall not be made separately (except when so scheduled) the cost being deemed to be included in the rates tendered for timberwork.

PB 12.7 All prices tendered for payment under items PB 12.1 to PB 12.6 as applicable shall include for the provision of all labour, plant, and materials (including waste) required to complete the respective items of work.

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OTHER PARTICULAR CIVIL SPECIFICATION PC: STEEL DOORS, WINDOWS, GLAZING & FIRE PROTECTION

PC 1 STEEL DOORS AND FRAMES

PC 1.1 Pressed Steel Door Frames

Pressed steel door frames shall be of welded one-piece construction or of an approved knock-down type for assembly on site, and constructed of mild steel sheet, pressed or rolled to the required shapes.

Frames for walls one brick thick shall have a single rebate profile and the frame material shall be at least 1,6 mm thick.

All other frames, unless otherwise specified, shall be double rebated and manufactured from metal at least 1,6 mm thick.

Frames shall be of widths required to suit the thickness of walls into which they are to be 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 frame shall be fitted with transoms of pressed or rolled steel sheet as above rebated for fanlights and for doors if required and shall have a nominal thickness of at least 1,6 mm thick metal. 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 have holes as and where required for screws for fixing fanlight openers, keeps of spring catches, etc. Where fanlights are shown to be fixed into frames, the frames shall be holed and tapped in the rebates suitable for screws for fixing the top centres.

Frames for single doors shall be fitted with an approved chromium plated, or stainless steel (unless otherwise specified) adjustable striking plate keep, boxed in at the back of the frame with a sheet metal box welded on, and not less than two rubber buffers.

All welding shall be cleaned off smooth and flush on exposed surfaces and frames shall be cleaned and primed as described for steel windows, before leaving the manufacturer's works.

PC 1.2 Steel Doors, Sidelights and Fanlights

PC 1.2.1 General Requirements

Steel doors shall comply with the requirements of SABS specification 727, constructed from mild steel sheet of at least 1,6 mm thick metal.

All doors, sidelights and fanlights, shall, in addition, comply with the following requirements:

- i) Suitable weather bars shall be provided to render external doors, etc., perfectly watertight.
- ii) Frames of doors, etc. where fixed to concrete columns, beams, etc., shall be provided with suitable lugs for fixing to plugs in the concrete at same spacing as the standard fixing lugs.
- iii) Doors, sidelights, fanlights, and components except where specified to be hot dip galvanised, shall be clean and primed as described below.

Door, 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.

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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 for outward opening doors shall be fitted at bottom with ceils of door framing section (stepped ceils) and frames for inward opening doors with metal ties, welded to frames, for embedding in thresholds (flush ceils).

After doors, sidelights and fanlights have been built in and before being glazed, they shall be checked for alignment, adjusted as necessary, and left in a satisfactory state and in good working order.

PC 1.2.2 Stock Doors Units

Stock doors, sidelights and fanlights shall be of the type shown on the drawings, the doors constructed of not less than 33 mm universal steel sections, and sidelights and fanlights of 25 mm sections as described for windows.

Each leaf of a double door and each single door shall be hung on three steel hinges having brass pins. Hinges shall be of the parliament type where frames are set back from wall faces and where doors are shown to fold back against these faces.

Doors shall be fitted with mortise locks having not less than three levers and heavy brass or chromium plated brass bolts. Handles and bolts are to have a polished finish, unless otherwise specified.

Fanlights shall be hung and fitted as described for steel windows.

PC 1.2.3 Purpose made Doors Units

Purpose made doors complete with frames shall be manufactured and set into brickwork as described on drawing 091070/W/451.

PC 1.3 Payment for Door Units

Door units shall be supplied and installed complete with frame, hinge, locks and bolts as scheduled or detailed on the Drawings. Each size and type shall be measured separately.
Unit : No

PC 2 STEEL WINDOWS

PC 2.1 Materials

Stock residential and industrial type steel windows shall comply with the requirements of SABS Specification 727, and all other types shall comply with the constructional and other requirements of the above specification wherever applicable. All windows shall in addition, comply with the following additional and/or amended requirements, via:

- i) Suitable weather bars shall be provided to bottom of inward opening and vertically pivot hung ventilators and to the bottom of all outward opening ventilators where they occur above other ventilators and elsewhere as may be required to render the windows perfectly watertight.
- ii) Frames for windows where fixed to concrete columns, beams, etc., shall be provided with suitable lugs for fixing to plugs in the concrete, or with holes for screwing to plugs in the concrete, all at the same spacing as the standard fixing lugs.

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- iii) 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 SABS 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 requirements of SABS 909. The primer shall be applied by dipping or by means of spray gun.

Ventilators hung at one side to open outwards for 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, the units shall be coupled together with standard coupling mullions and/or transoms.

Windows shall be fitted with brass handles, stays, catches and other fittings as later described. Those for windows constructed of universal sections shall have a polished finish whereas all other windows shall have a tumbled finish. The fittings shall be fixed in such a way as to be removable after windows are glazed.

After the windows have been built in, but before being glazed they shall be checked for alignment adjusted as necessary and left in a satisfactory state and in good working order.

PC 2.2 Construction

The construction of windows shall from an approved window manufacturer supplying the windows as specified on the detailed window schedule.

PC 2.3 Payment for Windows

Window units shall be supplied and installed complete as specified, scheduled and detailed on the Drawings, including for glazing. Payment will be by number for each type and size.
Unit : No

The tendered rates shall include for the provision for all materials (including fastenings, hinges, ironmongery, glass etc.) except where scheduled separately, and for all labour and plant required to build the windows into the structures.

PC 3 IRONMONGERY

All ironmongery shall be of best quality and shall be approved before fixing with screws or bolts of similar metal. No key shall pass a second lock. All screws, nails, bolts, etc., required for completion of the work, shall be supplied by the Contractor.

Prices for all ironmongery where scheduled separately are to include the provision of all materials, plant and labour necessary for fixing to softwood, hardwood or steel door frames as the case may be including all notches, grooves, sinking's, etc., where required. If not scheduled separately the cost of ironmongery shall be included in the price quoted for the parent body.

At junctions of differing floor finishing's provide and build in 25 x 3 mm brass strips with top edges flush with the adjoining finishing's. The cost of the brass strips shall be included in the floor materials and not paid for separately.

PC 4 GLAZING

PC 4.1 Glass Material

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All glazing to conform to SANS 10137 (SABS 0137) Code of Practice – The Installation of Glazing to Build and where applicable, SABS 1263 Part 1: Safety and Security Glazing Materials for Buildings.

PC 4.2 Fixing of Glass Panes

Glazing to windows shall be well bedded at both back and front with putty and sprigged or otherwise mechanically located in the window frames. All putty shall be carefully trimmed and cleaned off and finished to neat straight lines.

Glazing putting shall be in accordance with SABS 680 suitable for use with metal or wooden window frames as appropriate and shall be of the self-setting type unless shown otherwise on the drawings.

The window frames shall be primed with an appropriate and approved wood or metal primer before glazing is commenced.

PC 4.3 Payment for Glazing

Glazing will not be paid for separately (except where otherwise scheduled) as the prices scheduled for windows and glazed doors will be deemed to include all costs associated with the glazing. If scheduled separately, payment will be made by number of each size and type installed.
Unit: No

PC 5 FIRE PROTECTION EQUIPMENT (Small Buildings)

PC 5.1 General

Unless otherwise specified, all materials will comply with the relevant SABS specifications relating to Fire Protection.

PC 5.2 Fire Hose Reels

Each fire hose reel is to be an approved type complying with SABS 543 and constructed with 580 mm diameter pressed steel side discs, red enamelled with chromium plated centre. Each reel is to be provided with a 25 mm chromium plated gunmetal control valve fixed separately from the reel, a 30 m length of 20 mm rubber and canvas, or reinforced plastic, non-kink able hose terminating in a 5 mm chromium plated shut-off nozzle and chromium plated swivelling pulley and nozzle bracket.

The Contractor must fix the fire hose reels to walls where indicated on drawings with 10 mm diameter hook or rag bolts, not less than 150 mm long built into walls in 3:1 cement mortar. The centre of each fire hose reel, unless otherwise specified, is to be approximately 1.5 above floor level.

PC 5.3 Fire Extinguishers

Fire Extinguishers shall comply with the SABS 1573 specification and shall be the 9 kg dry chemical powder type, supplied by an approved reputable company and maintained by that company, unless otherwise specified on the schedule or drawings.

Extinguishers are to be mounted to walls, where indicated on drawings and fixed as per the manufacturer's specifications. Extinguishers are to be supplied with backing boards.

PC 5.4 Signage

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Escape routes and the locations of firefighting equipment are to be clearly indicated throughout the building and all signage is to comply with SABS 0400 and its relevant amendments.

PC 5.5

Payment for Fire Protection Equipment

Payment shall be by number of each item installed as scheduled.

Unit: No

Prices shall include for the provision of all materials, plant and labour necessary to complete the required installations.

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OTHER PARTICULAR CIVIL SPECIFICATION PD: PAINTING (OTHER THAN STRUCTURAL STEELWORK)

PD 1 SCOPE

This painting specification covers the normal work required for small to medium size buildings. It does not include for the painting of steelwork (which is the subject to SABS 1200HC as amended by PSHC), apart from galvanised iron for roof sheeting, gutters, downspouts, etc.

This specification should be adhered to, but as the formulation of paints is subject to continual modification the specification for a particular material may be amended should the paint manufacturer recommend an improvement thereto and provided such amendment is agreed by the Engineer.

A change of specification purely to reduce costs by using less suitable materials will not be accepted, except with the specific approval of the Engineer in special circumstances.

PD 2 MATERIALS

PD 2.1 General

All materials which are to be used for painting under this contract shall be from the same approved manufacturer (except in exceptional cases which have had prior approval from the Engineer) and shall be supplied in unopened cans. Thinning will be permitted only in conformity with the applicable manufacturer's recommendations.

The approved manufacturer of the paints shall be either Plascon Paints (Pty) Ltd or Dulux (Pty) Ltd as selected by the Contractor. Other manufacturers products may be used subject to them being approved by the Engineer prior to any orders being placed.

PD 2.2 Approved Materials

The following materials, as supplied by the selected paint manufacturer, are approved for use under this Contract.

	Applicable Clauses	Plascon References	Dulux Reference
Pre-paint treatment			
Bonding liquid	3.4.1	CVI.14	D192-0800
Knotting for timber	3.1	PK.2	G113-0816
Wood stopping	3.1	BS	-
Porous surface sealer	3.1	EPL 43	-
Primers for:			
Acrylic coat filler	3.2.1	X.107	D184-1005
Plaster (alkali resistant)	3.2.1	UC.56	D192-0802
Hardboard	3.2.2	X.165	-
Softwood timber	3.2.2	UC.2	D191-0801
Galvanised iron	3.5.1	G.I.P.	D193-0856
	3.5.2		
Aluminium	3.5.3	SNK	-
Water-Based Paint Systems			
PVA emulsion	3.2.1	EPL	D175-Line

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	Applicable Clauses	Plascon References	Dulux Reference
Acrylic PVA	3.3.1	P.3	D175-Line
Texture coating	3.3.2	FLX	D181-Line
Acrylic roof paint	3.4.1	TRP	D174-Line
Oil-Based Paint Systems			
Universal undercoat	3.2.2, 3.3.3, 3.5.2	UC.1	D196-0763
Stain for wood	3.2.3	SPS	G126-Line
Alloyed roof paint	3.5.1	RP	D252-Line
Gloss enamel	3.2.2, 3.3.3, 3.5.2	G	D232-Line
Varnishes			
Interior varnish for wood- gloss matt	3.2.3 3.2.3	X.33 X.44	G126-0826 -
Exterior varnish for wood- gloss matts	3.3.4 3.3.4	- -	G126-0820 -

PD 3 APPLICATION

PD 3.1 Surface Preparation

All surfaces to be painted must be thoroughly degreased, clean, and dry prior to commencement of painting. The local environs are to be free from dust whilst painting is in progress.

Ironmongery and fittings not to be painted shall either be removed and subsequently replaced or be suitably masked to prevent paint spots or streaks adhering to the surfaces.

All cracks are to be filled with the paint manufacturer's recommended filler suitable for the purpose and for the location (i.e. interior or exterior work). After drying, the filler is to be rubbed down to a smooth surface, flush with the adjacent surfaces.

Porous surfaces must be sealed in accordance with the paint manufacturer's recommendations.

Timber work shall be knotted and stopped as necessary prior to commencing painting.

All surface preparation shall be in accordance with the paint manufacturer's specifications.

PD 3.2 Painting Interior Surfaces

PD 3.2.1 PVA Emulsion System

- | | | |
|---------|--|---|
| 3.2.1.1 | Cement plaster
Concrete | apply one coat of acrylic filler coat followed by two coats of PVA emulsion paint |
| 3.2.1.2 | Gypsum plaster
Hardwall plaster
Gypsum board | Apply one coat of alkali resistant primer followed by two coats of PVA emulsion paint |

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3.2.1.3	Hardboard	Apply one coat hardboard primer followed by two coats of PVA emulsion paint
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PD 3.2.2 Gloss Enamel System

3.2.2.1	Cement plaster Gypsum plaster Hardwall plaster Gypsum board	apply one coat of alkali resistant primer followed by one coat universal undercoat and one coat of gloss enamel
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3.2.2.2	Hardboard	apply one coat hardboard primer followed by one coat of universal undercoat and one coat of gloss enamel
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3.2.2.3	Softwood timber	apply one coat of oil-based wood primer followed by one coat of universal undercoat and one coat of gloss enamel
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PD 3.2.3 Stain and Varnish System

3.2.3.1	Softwood timber	apply one coat of stain followed by two coats of varnish (matt or gloss as ordered)
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3.2.3.2	Hardwood timber	apply two coats of varnish (matt or gloss as ordered)
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PD 3.3 Painting Exterior Surfaces

PD 3.3.1 Acrylic PVA System

3.3.1.1	Cement plaster Concrete	apply one coat of acrylic filler coat followed by two coats of acrylic PVA paint
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3.3.1.2	Fibre-cement board	apply one coat of undercoat followed by two coats of acrylic PVA paint
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PD 3.3.2 Texture Coating System

	Cement plaster Concrete	plaster primer, acrylic filler coat followed by two coats of texture coating paint
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PD 3.3.3 Gloss Enamel System

	Cement plaster Softwood timber	as per 3.2.2.1 for interior surfaces as per 3.2.2.3 for interior surfaces
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PD 3.3.4 Varnish System

	Hardwood	apply two coats of ultraviolet resistant varnish (matt or gloss as ordered)
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PD 3.4 To Roof Areas (Other than Galvanised Iron)

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PD 3.4.1 Acrylic PVA System

Cement tiles
Clay tiles
Asbestos tiles
Asbestos sheets

apply one coat of bonding liquid followed by
two coats of acrylic emulsion roof paint

PD 3.5 To Non Ferrous Metal Surfaces

PD 3.5.1 Galvanised Iron Roofs

apply one coat G.I metal primer followed by
one coat micaceous iron ore roof paint

PD 3.5.2 Galvanised Iron Tubes etc.

apply one coat G.I metal primer followed by
one coat universal undercoat and one coat
gloss enamel

PD 3.5.3 Aluminium Surfaces

apply one coat of aluminium primer followed
by one coat of universal undercoat and one
coat of gloss enamel.

PD 4 MEASUREMENT AND PAYMENT

Measurement and payment for paintwork will not be made separately except where so scheduled in the schedule of quantities. In the latter case, the prices tendered are to cover for the provision of all materials, plant and labour necessary to prepare the surfaces and complete the work as specified. Payment will be made by lump sum for the entire painting work, or by individual sum for each unit scheduled, or by area.

Units : Lump Sum
: Individual Sum
m²

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OTHER PARTICULAR CIVIL SPECIFICATION PE: PIPELINE VALVES FOR WATER SUPPLY APPLICATIONS

PE 1 SCOPE

This specification covers the material and constructional requirements for resilient seal, wedge gate, reflux, butterfly, air and scour valves.

PE 2 DEFINITIONS

Single small orifice air valve - A valve capable of releasing small accumulations of air at all pressures throughout the working pressure range of the pipeline.

Single large orifice air valve - A valve capable of admitting or expelling large quantities of air during emptying and filling of the pipeline.

Double orifice air valve - A valve capable of satisfactorily carrying out the functions of both a single small orifice air valve and a single large orifice air valve.

PE 3 REQUIREMENTS

PE 3.1 General

The types, sizes, end connections, pressure ranges and other details of the valves required are detailed on the specification data sheets. Other data sheets are included to permit tenderers to offer variations to the specification to suit their standard products.

PE 3.2 Materials, Workmanship and Construction

PE 3.2.1 Wedge Gate Valves

Wedge Gate valves must comply with SABS 664 or SABS 191 as applicable for waterworks pattern valves.

Valves must also be provided with the following:

- a) Fully enclosed gearing, where necessary to limit the maximum torque to be applied at the hand wheel spindle or cap top to 120 Nm under an unbalanced pressure equal to the maximum working pressure for the classes scheduled.
- b) The facility to permit re-packing of the gland whilst the valve is under working pressure.
- c) Stainless steel jacking/limiting screws for valves with a nominal bore greater than 600 mm and with metal gates.

PE 3.2.2 Resilient Seal Valves (RSV's)

In addition to the requirements of 3.2.1 above, RSVs shall be provided with the following:

- a) Grade 304 stainless or EN57 steel spindles as scheduled.

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- b) At least two nitrile rubber "O" sealing rings in a corrosion resistant housing, plus one nitrile rubber wiper ring to prevent the ingress of dirt.

PE 3.2.3 Reflux Valves'

Single door reflux valves must be cast iron, spheroidal graphite (SG) iron or cast steel and comply with SABS 144 or SABS 192 as applicable. Unless otherwise scheduled, gunmetal trim shall be provided for cast iron valves and stainless-steel trim for cast steel valves.

Valves with a nominal bore greater than 600 mm must be of the double door or multi-door type and may be fitted with an integral bypass. In other respects, they must be in accordance with the specifications for the single door type.

A suitable arrow indicating the flow direction through the valve shall be cast onto the body of the valve.

PE 3.2.4 Butterfly Valves

The valves must comply with BS 5155 for tight shut off service for the types, classes and sizes listed in the "specification data sheets" or scheduled.

The basic materials for butterfly valves should be as follows:

Component		Class PN 10	Classes PN 16 + PN 25	Class PN 40
Body, disc hand wheel	DN 350 to 600	Cast iron or SG Iron	S G Iron	Cast Steel
	DN over 600 mm	S G Iron	Cast Steel	
Seating Ring	a) Separate	Gun metal or stainless steel	Stainless steel	
	b) Integral	Hard chrome coated	Nylon Coated	
Shaft or stub shafts		Stainless Steel		
Bearings		Vesconite, PTFE coated or other approved self-lubricating non-metallic material		
Seal Clamp Rings		Bronze or stainless steel	Stainless steel	Stainless steel

The bottom of the disc must move in the flow direction when opening. The valve shall be drop tight under the maximum pressure rating condition.

The face-to-face dimensions shall be as set out in table 6 of BS 5155 in the column headed "double flanged short" for double flanged valves and in the column headed "wafer long" for wafer valves.

A suitable arrow indicating the preferred flow direction through the valve, where such preference is applicable, shall be cast onto the body of the valve.

Unless otherwise scheduled a side mounted manual actuator shall be provided. The actuator shall be a separate unit bolted to the main valve body on the side designated in the data sheets when facing in the normal direction of flow. Water must not leak past the main shaft and enter the actuator. An indicator which shows the extent of opening of the valve disc must be fitted.

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The designated power source for the operation of a power operated actuator is given in the data sheets. The actuator shall comply generally with AWWA C 504 and shall be capable of withstanding opening and closing torques at least 30% in excess of those necessary under the maximum working condition using the designated power source.

All actuators, whether power operated or not, shall be supplied complete with horizontal hand wheel at a height that provides for reasonable operation in each situation shown on the drawings. The hand wheel shall comply with the relevant requirements of SABS 664. The hand wheel must be mounted on a vertical shaft and must require not more than 120 Nm of input torque to operate against a maximum unbalanced head equal to the pressure rating of the valve.

All power operated actuators are to be fitted with 'Open' and 'Closed' limit switches and a 4 - 20 mA position transmitter.

PE 3.2.5 Air Valves

The materials and workmanship employed in the manufacture of air valves shall be at least equal to the standard required by SABS 664 for waterworks pattern valves.

PE 3.3 Marking

In addition to the requirement of SABS 144 or SABS regarding marking, all valves must be provided with an identification plate on which the following information shall be indelibly cast or embossed.

- a) The item or tag number.
- b) The size or nominal bore of the valve.
- c) The class or working pressure of the valve.

PE 3.4 End Connections

End connections shall be flanged or screwed as scheduled.

- a) **Flanges** - Where flanged connections are specified the dimensions and drilling of the flanges must comply with SABS 1123 except where otherwise scheduled. The front faces of flanges must be flat and normal to the bore of the valve. The back of the flanges, bonnets etc. must be flat and normal to the bore or be spot faced over an area large enough to freely accommodate the washer and the nut.

Drilled holes for the passage of bolts must be provided where wafer type butterfly valves are scheduled.

Flange gaskets must be CPAF with a minimum thickness of 3 mm. Bolts must comply with SABS 135 or SABS 136. Washers must conform to SABS 1149. All ferrous nuts, bolts and washers must be galvanized to SABS 763.

- b) **Screwed ends** - Where screwed ends are specified the valve shall be threaded to BSP.

PE 3.5 Drawings

The supplier shall provide two paper prints of fully dimensioned drawings for each type of valve and actuator when requested by the Engineer.

PE 3.6 Mounting Feet

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Valves with a nominal bore of 450 mm or greater must be provided with mounting feet where called for on the specification data sheets.

PE 3.7 Lifting Eyes

A lifting eye at the top of the valve body shall be provided, where the combined mass of the valve bypasses and actuator exceeds 75 kg.

PE 3.8 Protection prior to Installation

Valves shall be temporarily always covered and protected against UV radiation prior to installation.

PE 4 TESTING

PE 4.1 Test Certificates

A test certificate shall be provided with each valve wherein it is certified that the valve has been inspected and tested and that it complies with the specification. An independent inspector may be appointed by the Employer to witness the testing; in such case the inspector must also sign the test certificate. The charges made by the independent inspector will be paid by the Employer.

At least three working days written notice must be given of the proposed date and time of the test. In the event that the valve(s) to be tested not being ready the Employer reserves the right to deduct any fruitless inspection costs from moneys due to the Contractor.

PE 4.2 Test Requirements

Hydraulic tests shall be carried out at the factory on each valve as follows:

PE 4.2.1 Gate Valves

In accordance with SABS 664 or SABS 191 (as applicable).

In addition to the test requirements in the applicable SABS specification all valves with a nominal bore greater than 450 mm shall be subjected to an open-end gate strength test of 1,5 times the working pressure. Drop tightness in respect of this gate strength test is not required.

PE 4.2.2 Reflux Valves

In accordance with the requirements of SABS 144 or SABS 192 (as applicable) to the following pressures:

- a) Body with clack open - 2,0 times class max working pressure
- b) Door strength - 2,0 times class max working pressure
- c) Seating with doors closed - 1,1 times class max working pressure, under which pressure the seat must be drop tight

The door strength must be capable of withstanding the test pressure applied to the body without damage or distortion.

PE 4.2.3 Butterfly Valves

Each valve is to be tested at the factory in accordance with the requirements of **BS 5155**.

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Each valve is to be tested at the factory as follows:

- a) **Body test** - The valve shall be filled with water and a pressure equivalent to twice the maximum working pressure shall be applied for 5 minutes. There shall be no loss of water from the valve during the test.
- b) **Low head leak test** - Lower the pressure to 20 kPa and maintain the pressure for 5 minutes. There shall be no loss of water from the valve during the test
- c) **Drop test** - One valve taken at random from each batch of ten small orifice and double orifice air valves (or less) shall be subjected to a "drop test". The valve shall be filled with water and pressurised to above the working pressure. While maintaining the pressure at least 200 kPa above the specified working pressure air shall be injected into the inlet of the air valve. Reduce the pressure slowly. The small orifice must open and discharge the air at a pressure not lower than the specified working pressure.

CORROSION PROTECTION

The cleaning and corrosion protection of valves must be carried out at the factory prior to despatch to the Site. Non-ferrous metal or stainless-steel surfaces must not be painted. The protection to be applied must comply with one internal and one external system from the following alternatives:

System 1 (Epoxy resin paint) - All cast iron surfaces of every valve, other than RSV's, must be prepared for painting to a thoroughly clean condition free of all grease and deleterious matter. Ferrous surfaces must be prepared in accordance with the Swedish Standard SIS 05 5900 to a Sa 3 finish. Surfaces must then be coated with a non-toxic epoxy resin paint to give a total minimum dry film thickness of 250µm to be pinhole free over the entire painted surface.

System 2 (Epoxy powder coating) - Electrostatically applied epoxy powder coating (ESPC), of the fully disassembled valves shall be carried out in accordance with SABS 1217 as may be modified by this specification. All RSVs are to be treated with this system.

All surfaces of the fully dis-assembled valve shall be blast cleaned to Sa 3 of Swedish Standard SIS 05 5900, having an angular profile of 40µm to 60µm.

The coating medium shall be an exterior grade, tinted, non-toxic and non-tainting, suitable for use with potable water and applied strictly in accordance with the manufacturer's instructions in a single application to a minimum film thickness of 300 µm. The coated surface shall be subjected to a standard MEK 50 double rub test. Particular attention shall be given to the thickness and integrity of the coating in the areas where the gate of the RSV is to operate. Low voltage, wet sponge EID detection of pinholes is to be conducted on all surfaces of the valve. A visual inspection, to be carried out by an experienced observer, shall reveal the finished coating to be smooth and glossy, free from excessive runs, sags, "orange peel" finish, occlusions and other visible defects.

The coating shall be subjected to a "hot water soak" adhesive test at the inspector's discretion, and no more than 15 mm disbandment from the point of the "V" (cut at a 30-degree angle) shall be permitted after immersing in water at 78°C for 48 hours, and testing adhesion after cooling to 25°C. Repairs shall be carried out using an approved repair system. (Hi-Cote" or similar approved).

System 3 (external only) - Apply multi coats of an approved epoxy coal tar paint to give a minimum total dry film thickness of 240µm. The paint shall be applied in accordance with the paint supplier's recommendation.

System 4 (external only) - Apply one coat of zinc chromate primer followed by one coat of undercoat tinted where necessary, and a final coat of best quality gloss enamel. The total dry film thickness of the system must be not less than 200µm.



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After erection on site all valves must be cleaned, and the paintwork refurbished where necessary to restore the condition to that pertaining at the time of leaving the factory.

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PART B: MECHANICAL

PSB 1 STANDARD SPECIFICATIONS FOR MECHANICAL WORKS (INCL. GENERAL WORKS)

<u>PSB1.1</u>	<u>ENVIRONMENT</u>
<u>PSB1.2</u>	<u>GENERAL</u>
<u>PSB1.3</u>	<u>DESIGN</u>
<u>PSB1.4</u>	<u>INSTALLATION</u>
<u>PSB1.5</u>	<u>MATERIALS</u>
<u>PSB1.6</u>	<u>CASTINGS</u>
<u>PSB1.7</u>	<u>FABRICATION OF CARBON STEELS</u>
<u>PSB1.8</u>	<u>FABRICATION OF STAINLESS STEELS</u>
<u>PSB1.9</u>	<u>WELDING</u>
<u>PSB1.10</u>	<u>CORROSION PROTECTION : APPLICATION AND CONTROL</u>
<u>PSB1.11</u>	<u>CORROSION PROTECTION: SURFACE PREPARATION</u>
<u>PSB1.12</u>	<u>CORROSION PROTECTION: METAL COATINGS</u>
<u>PSB1.13</u>	<u>CORROSION PROTECTION: PAINT COATINGS</u>
<u>PSB1.14</u>	<u>FASTENERS</u>
<u>PSB1.15</u>	<u>ANCHOR FASTENERS</u>
<u>PSB1.16</u>	<u>GRID FLOORING</u>
<u>PSB1.17</u>	<u>GUARD RAILING</u>
<u>PSB1.18</u>	<u>PERMANENT LADDERS AND STAIRS</u>
<u>PSB1.19</u>	<u>PIPEWORK</u>
<u>PSB1.20</u>	<u>FLANGES</u>
<u>PSB1.21</u>	<u>FLEXIBLE PIPE COUPLINGS</u>
<u>PSB1.22</u>	<u>CONDENSATE TRAPS FOR SEWAGE GAS</u>
<u>PSB1.23</u>	<u>FLAME ARRESTERS</u>
<u>PSB1.24</u>	<u>PRESSURE RELIEF AND VACUUM BREAKER VALVE WITH FLAME ARRESTER</u>

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PSB1.25	<u>VALVES FOR LIQUIDS OR GASES</u>
PSB1.26	<u>CHECK VALVES</u>
PSB1.27	<u>AIR VALVES</u>
PSB1.28	<u>PENSTOCKS</u>
PSB1.29	<u>VALVE ACTUATORS</u>
PSB1.30	<u>BASEPLATES</u>
PSB1.31	<u>GUARDS</u>
PSB1.32	<u>ELECTRIC MOTORS</u>
PSB1.33	<u>POWER TRANSMISSION</u>
PSB1.34	<u>MACHINE VIBRATION LEVELS</u>
PSB1.35	<u>NOISE CONTROL</u>
PSB1.36	<u>THERMAL LAGGING</u>
PSB1.37	<u>BEARINGS</u>
PSB1.38	<u>LUBRICATION</u>
PSB1.39	<u>SCREW PUMPS</u>
PSB1.40	<u>CENTRIFUGAL PUMPS</u>
PSB1.41	<u>SUBMERSIBLE AND IMMERSIBLE PUMPS</u>
PSB1.42	<u>DRAINAGE PUMPS</u>
PSB1.43	<u>POSITIVE DISPLACEMENT PUMPS</u>
PSB1.44	<u>METERING PUMPS</u>
PSB1.45	<u>PUMP SUCTION STRAINERS</u>
PSB1.46	<u>VERTICAL SHAFT MIXERS</u>
PSB1.47	<u>SUBMERSIBLE MIXERS</u>
PSB1.48	<u>SCREW CONVEYORS</u>
PSB1.49	<u>INSTRUMENTATION</u>
PSB1.50	<u>MAGNETIC FLOWMETERS</u>
PSB1.51	<u>GUAGES</u>
PSB1.52	<u>CHLORINATION SYSTEMS</u>

PSB1.53 CONTROL SYSTEMS

PSB1.54 SCADA SYSTEMS

PSB1.55 CONTRACTOR'S DRAWINGS

PSB1.56 TUITION

PSB1.57 OPERATING INSTRUCTIONS

PSB1.58 INSTALLATION, OPERATION AND MAINTENANCE MANUAL

PSB1.59 INSTALLATION, OPERATION AND MAINTENANCE MANUAL CONTENTS

PSB1.60 STARTING, SITE TESTING AND COMMISSIONING OF PLANT

ENVIRONMENT

The General Mechanical Specification shall apply wherever it is relevant to the Contract unless it is superseded in accordance with the precedence stated and, in particular, by the Detailed Specification.

GENERAL

Wastewater Treatment Works

For the purposes of this Specification all Wastewater Treatment Works shall be regarded as severe environments with some industrial pollution.

This environment is very corrosive to ferrous metals and, where the use of such metals cannot be avoided, the metals must be adequately protected, such protection systems being designed for a life of at least 15 years.

Sewage gas is also present throughout the treatment works and this may contain hydrogen sulphide which, in addition to being corrosive to ferrous metal, is also corrosive to most non-ferrous metals. **The effect on copper alloys can be particularly severe, often with disastrous effects on the reliability and life of switchgear, control systems, slip-rings, etc. Such equipment must therefore be adequately sealed and protected.**

DESIGN

General

This Specification lays down the performance, quality and overall system requirements of the Works. Deviation from the Specification will only be considered if the Engineer considers such deviation an improvement.

Safety

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Safety shall be an all-important and overriding consideration and proper attention shall be paid to this aspect at the design stage. The regulations of the Occupational Safety and Health Act 2005, as amended, shall be strictly observed.

Equipment which is potentially dangerous shall be designed in accordance with a relevant South African or international Standard.

The following must be noted:

- (a) Hazards must be avoided or guarded. Nip points shall be guarded; sharp corners shall be rounded off; operating handles, supports and protrusions shall be kept clear of access ways; and so forth.
- (b) The Contractor's Drawings and specifications shall clearly specify the structural requirements of the Works and the Contractor shall be responsible for covering all unsafe gaps and openings left in structures after installation.
- (c) Moving parts shall be properly guarded to the satisfaction of the Engineer.
- (d) An emergency stop button shall be installed in a convenient position next to each machine. The installation shall be designed to provide immediate access without the danger of accidental operation. In addition, trip wires which will stop the driving motor when pulled shall be provided along the accessible side/s of moving conveyor belts, chains and the like irrespective of operating speed and irrespective of guards provided.

Where, in the opinion of the Engineer, an installation is not safe, the Contractor shall remedy such defect at his own cost to the satisfaction of the Engineer.

Design Factors

A high-quality standard is demanded and reliability, long life, trouble free operation, efficiency, ease of maintenance and operation, and neatness are essential.

All plant and equipment shall be of robust construction and the design shall, as applicable, be based on:

- (e) the full range of duties which can be reasonably anticipated.
- (f) the power and torque transmitted by the driver system under full load and stalled conditions.
- (g) the maximum pressure or vacuum which can be produced by pumps, blowers and compressors under all conditions including blocked or closed inlet and outlet circuits.
- (h) conservative service and safety factors based on approved standards or laid down in the printed specifications of reputable and approved manufacturers.
- (i) a safety margin of at least 20% in addition to any service or safety factors which apply.
- (j) twenty-four hour per day operation.
- (k) a minimum life of 100 000 hours before repair or major part replacement.
- (l) prevention of serious damage from normal operational problems such as blockages, blinding, jamming, seizure, malfunction and, as far as is practical, maloperation, if these occurrences cannot be avoided by good design.

Machines with non-overloading characteristics shall be selected wherever possible, eg: motors shall be sized so that they cannot be overloaded by the driven machine.

Fail-Safe Operation and Protections

Where damage can occur from normal operational or other foreseeable problems, plant, equipment and systems must be designed to be fail safe, i.e. must have built-in redundant elements, or be fail-to-safe; i.e. must return to a safe condition where no further damage can be done in the event of a failure, malfunction, maloperation, and overload and, as far as practical, misuse. All reasonable and economically justifiable protections to prevent or limit damage to plant and equipment, particularly in high-risk situations, must be incorporated. Protections shall:

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- (a) be directed at the source of the problem, limit forces to safe levels and act quickly enough to prevent damage (electrical thermal type overloads are inadequate);
- (b) stop or prevent from starting all equipment at risk.
- (c) activate an alarm with a labelled indicator on the control panel whenever a protection operates.
- (d) not permit unauthorised tampering.
- (e) operate reliably after long inactive periods exposed to corrosive and dirty conditions.

Tenderers shall highlight equipment limitations which can be exceeded during operation and cannot be guarded against.

Moving Parts

The following general requirements apply not only to machines but to all equipment with moving parts such as headstocks, extension spindles, swivelling davits, heavy duty hinges, pivots and the like:

- (a) All rotating or swivelling shafts, pins and the like, shall be adequately supported, guided and restrained by lubricated or self-lubricating bearings, collars and/or bushes.
- (b) Swivelling joints on linkages and the like shall be of the "universal" or fork and rod type with bearings or bushes fitted to the eyes or forks.
- (c) On abrasive applications abrasion resistant materials and slow speed operation shall be utilised. Raw sewage and sludge shall be regarded as very abrasive.
- (d) All applications associated with wastewater shall be regarded as corrosive and materials of construction shall be selected to suit.
- (e) Susceptibility to fatigue failure shall be minimised by proper design and manufacturing procedures. Changes in section shall be radiused and care must be taken to avoid the use of welded components in areas of fluctuating stress.
- (f) The locking of nuts and pins in position shall be done to the approval of the Engineer.
- (g) Wearing parts shall be designed for interchangeability and ease of removal and replacement.

Arrangement and Mounting

The arrangement and general design shall take the following requirements into consideration:

- (a) Lifting eyes, lugs, hooks, etc., shall be provided on heavy or large items to facilitate handling.
- (b) Castings or fabrications shall have machined pads for seating and be mounted on either soleplates or baseplates as appropriate.
- (c) Where accurate alignment is required, positioning pins and/or jacking screws shall be provided.
- (d) The needs of operation and maintenance including neatness, access, working space, safety, cleaning, adjustment, handling, assembly, alignment, disassembly, removal, etc.
- (e) With plant and equipment to be mounted on or against concrete or brick structures built by others, provision shall be made for adjustment in the mechanical design. Any special accuracy requirements must be specified on the Contractor's Drawings.

INSTALLATION

General

The Works shall comply with the following:

- (a) When erected and installed, the plant and equipment shall be of neat and workmanlike appearance, solidly and evenly supported, true to line, level, plumb and in proper working order.
- (b) The requirements of Sub-clause "Arrangement and Mounting" (see Clause "Design") must be noted.

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- (c) The Contractor shall provide all foundation bolts, supports, hangers, brackets, etc. required for the support and fixing of his equipment.
- (d) The Contractor is responsible for grouting puddle pipes which pass through liquid retaining walls or slabs and for all other grouting necessary for all plant and equipment.
- (e) The use of more than three shims in the alignment of equipment will not be permitted. Machined spacers shall be prepared where necessary. Shims and spacers shall be of a corrosion resistant material such as stainless steel.
- (f) Corrosion protection requirements shall be carefully attended to and the relevant paragraphs of Sub-clause "Paint Application" (see Clause "Corrosion Protection: Paint Coatings) must be noted. All mating faces must be coated before and sealed after assembly.
- (g) Fastener threads must be coated with a nickel-based, anti-seize compound before assembly.
- (h) Crevices which are formed between two surfaces shall be filled, prior to final fastening, with a suitable formable packing, Denso tape or equivalent. This applies particularly to stainless steel.

Alignment of Shafts

Shafts for drives, such as motors, with an output above 150 kW shall be aligned to the driven shaft as follows:

- (a) Final alignment shall be done after installation and before commissioning, shall be checked in the presence of the Engineer and shall be to his approval. Alignment shall be sufficiently accurate to ensure that no initial pre-load is placed on the shaft coupling.
- (b) Each motor shall be aligned to its pump using laser aligning equipment with real time computer display.
- (c) The use of pourable epoxy resin chocks (Epocast 36, Chockfast or equivalent) shall be acceptable. If pourable chocks are used, the baseplate feet do not have to be machined but each machine foot shall be provided with a screw for vertical alignment. The chock thickness shall not be less than 20 mm.

MATERIALS

Materials - Generally

All materials used in the manufacture and construction of plant and equipment shall be new, unused and shall be the best of their respective kinds. The Contractor shall ensure that the materials are selected in accordance with the best engineering practice to suit the working conditions and the extremely corrosive environment.

Steel

All structural steel shall comply with the requirements of SABS 1431 grade S 355 JR and shall be legibly marked with the maker's name or trademark and identification marks.

Stainless steel

The AISI grade of stainless steel to be used will normally be specified in the Detailed Specification. Unless otherwise specified, rolled material shall be supplied with a matt, annealed and pickled or otherwise de-scaled surface finish. For wrought steels, the equivalent BS 970 grade may in each case be used. The common applications are as follows:

<u>APPLICATION</u>	<u>AISI</u>	<u>BS 970</u>
Wastewater Treatment Works (all applications):		
welded	316L	316S12
not welded	316	316S16

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Low corrosion interior:

welded	304L	304S12
not welded	304	304S15

Exterior and corrosive interior:

welded	316L	316S12
not welded	316	316S16

A manufacturer's test certificate shall be provided for each batch of stainless-steel giving details of the material analysis and any mechanical tests carried out on the material. Each stainless-steel item supplied shall be clearly and permanently marked with the grade of stainless steel and cross-referenced to the applicable test certificate.

Where grades 316 and 304 are mentioned in the Tender Documents, these shall be taken synonymously with grades 316L and grade 304L, respectively.

3CR12

This is the titanium stabilised, 12% chrome steel as produced by Columbus Stainless, South Africa.

3CR12 shall always be supplied with an annealed and pickled finish. 3CR12, in cases where it is to be coated, shall be suitably abrasive blasted to ensure adherence of the prime coat.

Plastics

Thermoplastics and fibre reinforced polymers shall be UV resistant, have adequate tensile strength and high impact strength and generally suit the application.

PVC is regarded as too brittle and shall not be used unless called for in this Specification or approved in writing by the Engineer before supply.

CASTINGS

Castings shall comply with the relevant South African or British Standard for the material used, including the following:

Grey Cast Iron Castings	-	SABS 1034	BS	1452
S.G. Iron Castings	-	SABS 936/7	BS	2789
Steel Castings (General Purpose)	-	SABS 1465	BS	3100
Aluminium Castings	-	SABS 989/992	BS	1490
Copper and Copper Alloy Castings	-	SABS 200	BS	1400

Particular attention shall be paid to cleanliness, soundness and neat fettling and dressing of castings. Surfaces shall be smooth and irregularities caused by mould washaways, and the presence of porosity and sand and slag inclusions will not be tolerated. Areas under bolt heads, nuts and washers, shall be machined or spot faced to ensure a flat and smooth pressure bearing area, and sufficient space shall be provided for the use of ring or socket spanners.

All pressure retaining castings shall be hydrostatically tested to not less than 1,5 times the maximum working pressure after machining and shall be pressure tight.

No repairs shall be undertaken to castings without the written permission of the Engineer and **welding will not be permitted on cast iron castings.**

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Castings shall be heat treated to provide optimum corrosion resistance and toughness combined with reasonable machinability. In particular stainless-steel castings shall be heat treated so as to ensure that all carbides are in solution, to ensure optimum grain size, and to provide maximum corrosion resistance.

The Contractor shall provide a test certificate for each casting or batch of castings, except for those made of grey cast iron, giving details of the material analysis, the heat treatment and any mechanical tests carried out.

FABRICATION OF CARBON STEELS

Standards

Steelwork shall be constructed fabricated and erected in accordance with SABS Standard Building Regulations, Chapter 6, "Structural Steelwork", and with SABS 1200H where applicable.

Finish

Weld spatter and other protrusions shall be removed. Sharp edges shall be rounded to a radius of at least 2 mm.

Requirements for Corrosion Protection

In addition to finishing requirements, the requirements of corrosion protection application shall be taken into consideration. All surfaces must be accessible for surface preparation and coating. Inaccessible pockets, open hollow sections or the like shall not be permitted except where hot-dip galvanizing (without painting) is called for. Surfaces which cannot be properly prepared after fabrication must be abrasive blasted and coated with a two-pack epoxy pre-weld primer before fabrication.

Drawings

General and detailed fabrication drawings shall be submitted by the Contractor for approval by the Engineer. Full details of the welding procedures and standards which he proposes to use shall be shown on these drawings.

Inspections

The Contractor shall arrange for the Engineer to inspect fabrications, including fabricated pipework, in the fabrication workshop and prior to corrosion protection.

FABRICATION OF STAINLESS STEELS

The requirements regarding the fabrication of carbon steels apply to the fabrication of stainless steels as well. In addition, the following requirements apply to the fabrication of stainless steels:

- (a) Fabrication of stainless steels and 3CR12 shall follow the recommendations in "The Stainless-Steel User Manual" and "The 3CR12 Fabrication Guide" issued by Columbus Stainless. Only fabricators experienced with stainless steel will be considered acceptable. Such fabricators shall use permanently dedicated storage and fabrication areas and shall use machines, tools and handling equipment suited and permanently dedicated to this type of material.

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- (b) Surfaces which become contaminated with steel or otherwise stained or otherwise marked to be of uneven colour, shall be cleaned by pickling or electro-cleaning rather than by grinding.

The Contractor shall arrange for the Engineer to inspect fabrications, including fabricated pipework, in the fabrication workshop.

WELDING

General Welding Requirements

- (a) **STANDARDS:** Standards complying with good modern practice, and acceptable to the Engineer, shall be adopted. These include the following:

BS	5135	-	Arc	welding	carbon	and	carbon	manganese	steelwork.
BS	4677	-	Arc	welding	austenitic		stainless	steel	pipework.
BS	2633	-	Class	1	Arc	welding	of	steel	pipework.
BS	2971	-	Class	II	Arc	welding	of	steel	pipework.
BS	806	-	Design and construction of ferrous piping in connection with land boilers						
(used	for	arc	welding	specification	of	all	pipe	flanges).	

Welders shall be experienced competent artisans approved in accordance with BS 4872.

- (b) **WELDING TO BE CONTINUOUS:** All welding shall be continuous on all sides of any joint unless otherwise approved in writing by the Engineer. No crevices will be permitted and where stitch welding has been approved by the Engineer, the crevices so left shall be sealed with an approved filling compound after priming but before further painting.
- (c) **WELD APPEARANCE:** Welding shall be free of blowholes and all welding flux shall be removed. All weld spatter and other sharp imperfections shall be removed prior to abrasive blasting. Prior to painting, weld beads with a surface irregularity exceeding 3 mm or with sharp crests having a radius under 2 mm shall be ground. Weld grinding must not be performed on 304L or 316L stainless steel, however, unless unavoidable.
- (d) **ITE WELDING:** Site welding shall be kept to a minimum and shall only be undertaken with the approval of the Engineer.

Welding of Stainless Steel and 3CR12

- (a) **WELDING STAINLESS STEEL:** Stainless steels shall be welded strictly as recommended in "The Stainless-Steel User Manual" issued by Columbus Stainless.
- (b) **WELDING 3CR12:** 3CR12 shall be welded strictly as recommended in "The 3CR12 Fabrication Guide" issued by Columbus Stainless.
- (c) **TYPE OF STAINLESS STEEL:** Austenitic stainless steels to be welded shall be of the low carbon grade (i.e.: 304L, 316L, etc.).
- (d) **WELDING RODS:** The welding rods used shall be the most suitable for the metal and purpose. Type 309 stainless steel welding rods shall be used for welding 3CR12 unless otherwise approved in writing.
- (e) **WELDERS:** Only welders experienced with welding stainless materials shall be used.

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- (f) **GENERAL:** All possible steps shall be taken to ensure maximum corrosion resistance and strength of the welds and welded material. Special care shall be taken to avoid prolonged heating. Welds shall be passivated. Discolouration and steel contamination must be removed by pickling or electro-cleaning as approved by the Engineer but should rather be avoided by taking the appropriate measures.

CORROSION PROTECTION: APPLICATION AND CONTROL

Painting Contractor

Surface preparation and coating application shall be carried out by experienced industrial painting contractors who are fully equipped and staffed to do such work in their own covered premises strictly in accordance with the paint manufacturer's recommendations. Before proceeding with the corrosion protection coatings, the Contractor shall submit the name of the painting sub-contractor for approval by the Engineer.

Site Work

Surface preparation and coating application shall not be done on Site except for minor repairs, for application of the final aesthetic coat, where specifically called for in the Detailed Specification or where permitted by the Engineer in writing.

Systems to be used

- (a) **SYSTEMS:** The corrosion protection systems to be used on the plant and equipment will usually be specified in the Detailed Specification, but if not, the Contractor shall recommend a suitable system for approval by the Engineer. If doubt exists as to the system or colour to be used, the Engineer's requirements must be ascertained.
- (b) **ALTERNATIVE SYSTEMS:** Alternative systems superior to those specified may be used if approved in writing by the Engineer.
- (c) **ALL ITEMS TO BE PAINTED:** Except where otherwise specified, all metal surfaces shall be painted. This includes hot-dip galvanized items and metal-sprayed coatings. In the latter case the paint shall be in the form of a sealer. Details of approved painting systems to be used are given below.
- (d) **COATING APPEARANCE:** After installation on Site the finished paintwork must be neat, smooth, of uniform colour and to the approval of the Engineer.
- (e) **316 STAINLESS STEEL:** It is not usually necessary to paint 316 stainless steel. If corrosion of 316 stainless steel does occur, and depending on the appearance or extent of the problem, the Engineer may call for pickling, electrocleaning, painting or replacement of the item at no additional cost. Painting may however be required if contaminated or stained surfaces cannot be properly cleaned or where stitch welding has been approved.

Quality Control of Coating Application

- (a) **INSPECTION:** The Contractor shall arrange for the coating application on fabricated steelwork to be inspected throughout by the Engineer. The Engineer may approve inspections by an independent competent person (hereinafter called the Inspector) appointed by and at the cost of the Contractor. Inspections shall be adequate to ensure compliance with the Specification and shall be done at the following stages as a minimum:

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Coating (Metal-Spray, Paint, etc.)

- ✦ After fabrication but before surface preparation.
- ✦ After surface preparation but before application of the first coat.
- ✦ After application of the final sprayed metal coating or after application of the paint primer or first coat (as applicable).
- ✦ After the final factory applied paint or sealing coat.

Hot-dip Galvanizing

- ✦ After fabrication but before hot-dip galvanizing.
- ✦ After hot-dip galvanizing.

Duplex Protection (Hot-dip Galvanizing and Coating)

- ✦ After fabrication but before hot-dip galvanizing.
- ✦ After hot-dip galvanizing but before application of the first coat.
- ✦ After application of the primer.
- ✦ After the final factory applied paint coat.

- (b) **WITNESSING OF INSPECTION:** If the coating is to be done in by an inspector other than the Engineer, the Contractor shall, nevertheless, arrange for the Engineer to witness the inspections at his discretion.
- (c) **INSPECTION REPORT:** A written report of the inspections, prepared by the Inspector and by both the Inspector and the Contractor, shall be submitted to the Engineer before delivery of the equipment to Site.
- (d) **INSPECTOR QUALIFICATIONS:** Inspectors appointed by the Contractor shall hold an appropriate qualification from either the CISA, the SAIW or the SAQCC.
- (e) **IDENTIFICATION OF ITEMS:** Every item to be coated shall be identified by a welded or hard-stamped code. Records shall be maintained for each item.

CORROSION PROTECTION: SURFACE PREPARATION

Imperfections

Welding shall be free of blowholes and all welding flux removed. All weld spatter, sharp edges and other imperfections shall be removed prior to abrasive blasting. Prior to painting, weld beads with a surface irregularity exceeding 3 mm or with sharp crests having a radius under 2 mm shall be ground. (Weld grinding must not, however, be performed on stainless steel). Areas to be painted shall be free of crevices. If the Engineer has permitted stitch welding in terms of Clause "Welding", crevices shall be filled with a compatible sealing compound after the priming coat has been applied.

Abrasive Blasting

Before coating all surfaces shall be properly degreased and abrasive blast cleaned to an SA3 finish with a 40-65 µm surface profile to Swedish Standard SIS 055900 of 1967. The abrasive shall comply with paragraph 4.3.3 of SABS 064 and shall be free from all traces of oil, grease, foreign matter, and corrosive contaminants such as chlorides, etc. The prepared surface shall be given the first coat of the painting system within 4 hours after cleaning.

In instances where stainless steel and 3CR12 are to be painted, the surface shall be suitably abrasive blasted prior to primer application.

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Between Coats

Between coats or with previously painted surfaces in good condition, all traces of oils, greases, soluble salts and corrosive air borne contaminants shall be thoroughly washed from the surface to be painted using a detergent type cleaning agent, rinsed and dried. The previous coat shall then immediately be lightly sanded or otherwise prepared as recommended by the paint manufacturer, wiped clean, dried and painted. Solvents are not acceptable as a surface cleaning agent.

Hot-Dip Galvanized Surfaces

Hot-dip galvanized surfaces to be painted shall be free from white rust and shall be cleaned with an approved water based galvanizing cleaner using non-metallic abrasive pads until a "water break free" surface is obtained. The surface shall then be thoroughly rinsed with clean potable water to remove all residues and dried immediately prior to painting. Where necessary to obtain adhesion a sweep blast of the surface shall be done after cleaning.

CORROSION PROTECTION: METAL COATINGS

General

Fabrication of items to be protected by metal coatings shall be in accordance with SABS ISO 14713.

Hot-Dip Galvanizing

- (a) **STANDARD:** Hot-dip galvanizing shall be done in accordance with SABS ISO 1461:1999 Hot-dip Galvanized Coatings on Fabricated Iron and Steel Articles.
- (b) **THICKNESS:** Coatings shall be to the thicknesses detailed in the Standard.
- (d) **PASSIVATION:** Hot-dip galvanized material which is to remain unpainted shall be passivated as specified in SABS 763. Items to be painted after hot-dip galvanizing shall be air dried and not passivated.
- (e) **WHITE RUST:** Hot-dip galvanized material shall be substantially free from white rust when it is erected on site. Stacking and storing shall at all times be done in a manner to prevent white rust forming.
- (f) **REPAIR:** Damage to hot-dip galvanizing caused by welding, grinding, etc. is not acceptable. The repair to hot-dip galvanizing damaged by handling or transport shall be done by cleaning the area and applying 3 coats of a zinc rich primer giving a dry film thickness of at least 100 µm and containing at least 94 % zinc in the dried film. If the opinion of the Engineer is that damage is excessive, such items will be rejected by the Engineer and shall be replaced by the Contractor at his own expense.
- (g) **WELDING:** Welding after hot-dip galvanizing is not acceptable.
- (h) **TEST CERTIFICATE:** The Contractor shall supply a galvanizer's guarantee or test certificate prior to installation.

Sprayed Metal Coatings

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- a) **STANDARD:** Sprayed metal coatings shall be done in accordance with SABS 1391: Standard Specification for Thermally Sprayed Metal Coatings as amended below. The statements below apply to Part 1 of SABS 1391.
- b) **SYMBOLS:** The type symbol described in Table 1 of the Standard shall be used to specify material and thickness requirements in the Detailed Specification; i.e. AL for aluminium, Zn for zinc, followed by the minimum average thickness in microns.
- c) **THICKNESS:** The minimum coating thickness for both Aluminium and Zinc shall be 150 µm. Greater thicknesses may be specified in the detail specifications.
- d) **THICKNESS TESTING PROCEDURE:** The procedure laid down in Clauses 4.2.1.3 a(1) or b(1) of SABS 1391: Part 1 for the determination of the coating thickness shall not be regarded as sufficient. The thickness shall be checked on every surface plane at points not more than 300 mm apart for small articles and 500 mm for large articles, e.g. angles shall be checked along all 4 surfaces, channels along all 6 surfaces, pipes in 4 planes etc. The minus tolerance on thickness in isolated areas shall also not exceed -10% and such low areas shall not be larger than 50 mm in diameter.
- e) **PERIOD BETWEEN PREPARATION AND COATING:** For Clause 3.3 of SABS 1391: Part 1, the time between preparation and coating shall be shortened from 4 hours to 2 hours at any application area closer than 10 km from the coast.
- f) **SEALING:** Unless otherwise specified, all metal coatings shall be sealed immediately after metal-spraying using a suitable pre-treatment wash primer followed by coats of low viscosity sealant until absorption is complete. This shall be followed by a suitable topcoat system to give a smooth final finish. The various coatings used shall be as specified or, if not specified, shall be selected by the Contractor to suit the duty and submitted to the Engineer for approval. The final coat shall normally be applied on site after installation. Colours shall be as specified or as agreed with the Engineer. Depending on the application, the following systems are acceptable:

System 1

- ✦ Application of micaceous oxide pigmented polyamide cured epoxy to achieve a dry film thickness of 60-80 µm; (Sigmarite Sealer, or equivalent).
- ✦ One coat of solvent borne modified acrylic coating to achieve a dry film thickness of 70 µm; (Sigma Topacryl coating, or equivalent).
- ✦ One coat of solvent borne modified acrylic finish to a dry film thickness of 30-45 µm; (Sigma Topacryl finish, or equivalent).

System 2

- Application of one coat of two component epoxy primer to a dry film thickness of 40 µm; (Intergard 269, Chemrite Carboline Rustbond Penetrating Sealer, or equivalent).
- Application of one intermediate coat chemical resistant vinyl copolymer to a minimum dry film thickness of 70 µm.
- Application of one coat of vinyl copolymer chemical resistant enamel to a minimum dry film thickness of 40 µm.

System 3

- Application of one coat of two component epoxy primer to a dry film thickness of 40 µm; (Chemrite Carboline Rustbond Penetrating Sealer, Intergard 269, or equivalent).
- Application of two coats of polyurethane enamel (twin pack) to a minimum combined dry film thickness of 70 µm.

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CORROSION PROTECTION: PAINT COATINGS

Paint Selection

- a) **PAINT QUALITY:** Paint shall be of best quality, of approved manufacture and brand and comply with the requirements of the relevant SABS or BS specifications.
- b) **COMPATIBILITY:** To avoid incompatibility between paint coats due to variations in formulation, the different coats in any one paint system shall be provided by the same manufacturer.
- c) **CONFIRMATION OF SUITABILITY:** Contractors shall obtain confirmation from their paint suppliers that, when using their paints, the systems specified are technically correct and suitable for the application and the material being coated.

Paint Application

- a) **SURFACE PREPARATION:** All surfaces shall be properly prepared as specified in Clause "Corrosion Protection: Surface Preparation".
- b) **PAINTING:** Paints shall be applied strictly in accordance with the manufacturer's instructions by tradesmen skilled in this class of work. Thinning of paint shall only be allowed for spray application and the manufacturer's recommended thinners shall be used.
- c) **COATING OF HIDDEN AREAS:** Areas which will be inaccessible after erection and surfaces resting on floors shall receive the full paint system prior to erection. Mating or contact surfaces shall be prepared and primed and be brought together while the paint is still wet.
- d) **ITEMS ENCASED IN CONCRETE:** Metal to be encased in concrete shall be painted externally up to 30 mm inside the concrete section, leaving the remainder bare so as to facilitate bonding with the concrete.
- e) **CREVICES:** Crevices will not be permitted. Where unavoidable crevices are accepted by the Engineer, such crevices shall be filled with compatible filler after application of the priming coat.
- f) **PROTECTION OF MACHINED SURFACES:** Where painting of machined surfaces is not possible or advisable, these surfaces shall be coated with an approved proprietary anti-corrosion compound giving 12 months protection under operating conditions. Shaft ends and machined mating or mounting surfaces or pads shall be so coated and shall not be painted.
- g) **COATING THICKNESS:** The dry film thickness shall be measured using a non-destructive thickness gauge such as the "Mikrotest" or equivalent and shall comply with the Specification.
- h) **REPAIR:** Painted areas damaged during transportation, erection or any means whatever shall be repaired as follows - Rusty spots shall be removed and cleaned by means of a wire brush or emery paper to a bright metal finish and the surrounding paint which is still intact shall be feathered for a distance of 50 mm beyond the damaged area. Spot priming and repair shall consist of all the coats previously applied and shall overlap the undamaged area.
- i) **PROTECTION ON SITE:** Proper and adequate use of cover sheets and other means shall be made to protect the existing paintwork from damage and from metal dust and sparks when welding, grinding, and wire brushing on site. Similarly effective steps shall be taken to prevent spillage or splashing or other damage to floors, walls and equipment when painting on site and any damage or mess caused shall be corrected at the Contractor's cost.

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- j) **FINAL COAT:** The final external coat/s shall always be applied on site after installation except for System A/1, where all coats shall be applied by a specialist applicator at his premises. A professional, smooth finish with a uniform colour is required.

Final Colour Code - General

The final colour code, with the exception of projects for wastewater treatment works, shall be as follows:

PIPEWORK				
CONTENTS OF PIPE	BASIC COLOUR	COLOUR OF INDICATOR		
		1 BAND	2 BANDS	3 BANDS
AIR				
Compressed, Power	Arctic Blue (F28)		-	-
Aeration	Arctic Blue (F28)	Canary Yellow (C61)	-	-
Instrument	Arctic Blue (F28)	Salmon Pink (A40)	-	-
Vacuum	Arctic Blue (F28)	Primrose (C67)	-	-
Lime Transfer	Arctic Blue (F28)	Crimson (A03)	-	-
Backwash	Arctic Blue (F28)	Verdigris Green (E22)	-	-
CHEMICALS				
Aluminium Sulphate	Jacaranda (F18)	Verdigris Green (E22)	-	-
Sodium Aluminate	Jacaranda (F18)	Crimson (A03)	-	-
Ferric Sulphate	Jacaranda (F18)	Canary Yellow (C61)	-	-
Lime (dry powder)	Jacaranda (F18)	Salmon Pink (A40)	-	-
Activated Carbon	Jacaranda (F18)	Light Stone (C37)	-	-
Polyelectrolyte	Jacaranda (F18)	Cloud White (G80)	-	-
GASSES				
(other than air); liquefied or gaseous				
Butane, Propane	Light Stone (C37)	-	-	-
Ammonia	Light Stone (C37)	Ultramarine (F09)	-	-
Blast furnace	Light Stone (C37)	Crimson (A03)	-	-
Carbon Dioxide	Light Stone (C37)	Light Brunswick Green (H07)	-	-
Coke Oven	Light Stone (C37)	Light Grey (G29)	-	-
Producer	Light Stone	Verdigris Green	-	-

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	(C37)	(E22)		
Chlorine, Hypochlorite	Light Stone (C37)	Canary Yellow (C61)	-	-

WATER				
Cold Drinkable	Brilliant Green (H10)	Cornflower (F29)	-	-
Hot Drinkable	Brilliant Green (H10)	Crimson (A03)	Cornflower (F29)	-
Boiler Feed (Distilled)	Brilliant Green (H10)	Crimson (A03)	Cloud White (G80)	Crimson (A03)
Boiler Feed (De-mineralised)	Brilliant Green (H10)	Cloud White (G80)	-	-
Industrial, Raw	Brilliant Green (H10)	Golden Yellow (B49)	-	-
Reclaimed	Brilliant Green (H10)	Jacaranda (F18)	-	-
Backwash	Brilliant Green (H10)	Light Stone (C37)	-	-
De-sludge	Brilliant Green (H10)	Canary Yellow (C61)	-	-
Stove Circulating	Brilliant Green (H10)	Salmon Pink (A40)	-	-
Hydraulic Power	Brilliant Green (H10)	Terra Cotta (A10)	-	-
Final Treated Effluent	Aquamarine (E67)	-	-	-
Interchange, Stage	Drakensberg Green (H36)	-	-	-
Raw Sewage	Olive Green (H05)	-	-	-
Sea Water	Light Brunswick Green (H07)	-	-	-
Primary Sludge	Dark Brown (B03)	-	-	-
Waste Activated Sludge	Light Brown (B15)	-	-	-
Digested Sludge	Light Brown (B15)	Light Olive Green (H21)	-	-
Pasteurised Sludge	Light Brown (B15)	Cloud White (G80)	-	-
OIL				
Diesel Fuel	Golden Brown (B13)	Cloud White (G80)	-	-
Hydraulic Power	Golden Brown (B13)	Salmon Pink (A40)	-	-
Lubricating	Golden Brown (B13)	Verdigris Green (E22)	-	-
Transformer	Golden Brown (B13)	Crimson (A03)	-	-

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Paraffin	Golden Brown (B13)	Arctic Blue (F28)	-	-
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PLANT AND EQUIPMENT	
EQUIPMENT	COLOUR CODE
FIRE FIGHTING	
Equipment and Pipework	Signal Red (A11)
ELECTRICAL	
Distribution Boards, Switch-Gear, Terminal Boxes and Conduits	Light Orange (B26)
Emergency Stop	Signal Red (A11)
MACHINE GUARDS	
Inside	Light Orange (B26)
Outside	Colour of Machine
Protruding Shafts, Exposed Gear Wheels and Rotating Parts	Light Orange (B26)
HANDRAILS	
Horizontal Rails and Chains	Golden Yellow (B49)
Stanchions	Black
Protrusion, Sides of Ramps	Black and Yellow Diagonal Stripes
GENERAL	
Scour Pipes	Deep Buff (B24)
Valves	Basic colour of pipeline
WORKSHOP FLOOR DEMARCATION	
Demarcation Lines	Golden Yellow (B49)
Working Areas	Pastel Grey (G54)
No Parking, No Storage	Golden Yellow (B49)
Aisles and Walkways	Brilliant Green (H10)
Storage Area	Terracotta (A10)
<i>Urethane based paint is to be used for concrete surfaces</i> <i>Traffic paint is to be used for tarred surfaces</i>	

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Final Colour Code - Wastewater Treatment Works

NO	APPLICATIONS	COLOUR	SABS 1091
A	<u>WATER APPLICATIONS</u>		
A1	Fresh water	Cornflower	F29
A2	Sea water	Light Brunswick Green	H07
A3	Cooling water	Aquamarine	E67
A4	Final treated effluent	Aquamarine	E67
A5	Fire fighting	Signal Red	A11
B	<u>SLUDGES</u>		
B1	Interchange	Drakensburg Green	H36
B2	Raw sewage	Light Olive Green	H21
B3	Primary sludge	Dark Brown	B03
B4	Waste activated sludge	Light Brown	B15
B5	Digested sludge	Light Brown with bands of Light Olive Green*	B15/ H21
B6	Pasteurised sludge	Light Brown with bands of Cloud White*	B15/ G80
C	<u>OTHER LIQUIDS</u>		
C1	Drainage	Black	-
C2	Hydraulic oil	Salmon Pink	A40
C3	Lubricating oil	Verdigris Green	E22
C4	Polyelectrolyte	Aquamarine/bands of Dark Violet *	E67/F06
C5	Diesel Fuel	Golden Brown	B13
D	<u>GASES</u>		
D1	Chlorine, Hypochlorite	Canary yellow	C61
D2	Digester gas	Smoke Grey	F20
D3	Air	Arctic Blue	F28
D4	Oxygen	Cloud White	G80
D5	Ventilation air	Pale Grey	G62
D6	Steam	Silver (Aluminium)	-
D7	Hydrogen	Poppy Red	A14

* Bands shall be 250 mm wide, 4m apart.

Hot liquid lines shall have a 50 mm wide band of Crimson (A03) every 4 metres.

Final Colour Code (continued)

NO	APPLICATION	COLOUR	SABS 1091
E	<u>ELECTRICAL EQUIPMENT</u>		
E1	Motors: External	Light Grey	G29
E2	Motors: Cows; external and internal surfaces	Light Orange	B26
E3	Terminal boxes, Conduits	Light Orange	B26
E4	Emergency stop	Signal Red	A11
F	<u>MECHANICAL EQUIPMENT</u>		
F1	Pumps	To suit liquid being pumped	-
F2	Blowers, compressors, including ancillary equipment	Strong Blue	F11
F3	Turning shafts, couplings, pulleys, etc.	Light Orange	B26
F4	Baseplates	Black	-
F5	Direction arrows, Unit number, etc.	Black on white, white on other colours	-
F6	Valves	To suit liquid being handled	-
F7	Handwheels	Black	-
F8	Bridges for settling tanks	Light Admiralty Grey, or Arctic Blue	E46
F9	Bulk mechanical equipment, gearboxes, general fabrications, brackets, supports, etc.	Light Grey	F28
F10	Cranes and crawl beams	Golden Yellow	G29
G	<u>DANGER AREAS</u>		
G1	Guards : External and internal surfaces	Light Orange	B26
G2	Turning shafts, couplings, pulleys, fans, etc.	Light Orange	B26
G3	Fire fighting	Light Orange	B26
G4	Protrusions, Low beams, etc.	Signal Red	A11
G5	Handrails:	Black/Golden Yellow Stripes	---/B49
	Top horizontal and chains	Golden Yellow	B49
	Bottom horizontal	Black	-
	Stanchions	Black	-

EXCEPTION:

Items made of 316 or 316L stainless steel may be left unpainted provided the surface is of uniform self-colour without blemishes, rust, marks or stains. If blemished the surfaces must either be painted or cleaned by pickling and/or electro-cleaning (not grinding or other mechanical means).

Painting Systems

DEFINITION OF TERMS

The abbreviation "d.f.t." used in this Specification shall mean dry film thickness given in microns and, except where otherwise specified is the minimum (not average) thickness permissible.

SYSTEM A/1

Three coats of a low solvent, high solids, polyamine/amide cured, epoxy (twin pack) to a minimum thickness of 350 µm.

Notes:

- The coating shall undergo holiday detection over the full surface in accordance with SABS 1217. This test shall be done by an inspector holding an appropriate qualification from either CISA, the SAIW or the SAQCC.
- When applied to hot-dip galvanized surfaces, a suitable epoxy primer shall be used after careful surface preparation before applying this system.
- This system shall be applied by a specialist applicator prior to delivery to site with particular attention to the required interval between coats.
- The first and third coats shall be a different colour to the second coat.

Applied to:

- Items subject to immersion and/or wet abrasion, e.g. screw pumps, clarifier rotating arms, scum boxes and weirs, pipework, chutes, tanks, etc.

SYSTEM

A/2

System A/1, plus

1 Coat polyurethane enamel (twin-pack)

d.f.t = 350µm

d.f.t = 40µm

Total

d.f.t = 390µm

SYSTEM

A/3

3 Coats of a micaceous iron oxide pigmented polyamine/amide cured epoxy sealer/coating (twin pack) with d.f.t = 60 µm per coat. Total d.f.t = 180 µm.

Notes:

- Use Sigmarite Sealer, or equivalent.

Applied to:

- Hot dry applications up to 200 °C.

SYSTEM A/4

3 coats of a micaceous iron oxide pigmented polyamine/amide cured epoxy sealer/coating (twin pack) with a d.f.t = 80 µm per coat. Total d.f.t = 240 µm.

Notes:

- Use Sigmarite Sealer, or equivalent.

Applied to:

- Immersed applications in potable water up to 100 °C.

SYSTEM A/5

2 or 3 Coats polyamine/amide cured coaltar epoxy. Total d.f.t. = 400 µm.

Notes:

- Where paints are available in different colours, each coat shall be a different colour.

SYSTEM	B/1
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1 Coat aluminium filled epoxy (twin pack)	d.f.t.	=	125µm
1 Coat polyurethane enamel (twin pack)	d.f.t.	=	40µm
	Total d.f.t.	=	165µm

Application:

- A maintenance coat over weathered coatings on steel.

Notes:

- Surface preparation shall include, as a minimum, removal of all loose mill scale, non-adherent rust and loose paint prior to wire brushing and de-greasing and shall be in accordance with an appropriate internationally accepted standard such as the Steel Structures Painting Council of the USA or that of the Swedish Standards Institute's St standards.

SYSTEM	B/2
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1 Coat HB epoxy primer	d.f.t.	=	100 µm
2 Coats polyurethane enamel (twin pack)	d.f.t.	=	60 µm

Total d.f.t. = 160 µm

Applied to:

- Motors, gearboxes, cast iron components, steel fabrications, etc.

SYSTEM	C/1
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1 Coat inorganic zinc silicate	d.f.t.	=	75µm
1 Coat high build modified acrylic coating	d.f.t.	=	75µm
1 Coat modified acrylic finish to approved colour	d.f.t.	=	30µm
	Total d.f.t.	=	180µm

=180µm

Notes:

- The primer must be factory applied. The intermediate and final coats may be applied on Site.
- Particular care shall be taken to obtain the recommended anchor pattern during abrasive blasting and to achieve the required primer thickness on all surfaces in one coat.
- The primer shall be tested for full cure before applying the subsequent coats.
- This system shall not be used for items subject to immersion.
- Intermediate coat shall be Sigma Topacryl, or equivalent.
- Top coat shall be Sigma Topacryl Finish, or equivalent.

Applied to:

- Heavy fabricated steel items requiring a primer which travels well and/or can be left for an extended period before overcoating.

SYSTEM	C/2	("West Coast	Specification")
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1 Coat inorganic zinc silicate	d.f.t.	=	75µm
1 Coat epoxy tie coat	d.f.t.	=	75µm
1 Coat polyurethane enamel (twin pack)	d.f.t.	=	40µm
	Total d.f.t.	=	190µm

µm

Notes:

- The complete system must be factory applied and touch ups will be required on Site.
- The primer shall be tested for full cure before applying the subsequent coats.
- This system shall not be used for items subject to immersion.
- Applied to:

- Heavy fabricated steel items requiring a hard, high gloss colour finish - eg. bridges, tanks, non-immersed piping, structural steel, etc.

SYSTEM		C/3	
1	Coat inorganic zinc silicate	d.f.t	= 75µm
1	Coat modified silicone heat resisting coating suitable for	d.f.t	= 75µm
			200 °C
		Total d.f.t = 150	

µm

Notes:

- Particular care shall be taken to obtain the recommended anchor pattern during abrasive blasting and to achieve the required primer thickness on all surfaces in one coat.
- The primer must be factory applied.
- The primer shall be tested for full cure before applying the subsequent coat.
- A tie coat suitable for 200 °C shall be included between the primer and top coat if so recommended by the paint manufacturer.
- The top coat must cure at ambient temperatures.

Applied to:

- Steel and cast iron items on dry heat applications with temperatures up to 200 °C continuous.

SYSTEM		C/4
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3	Coats modified silicon	Total d.f.t = 120 µm
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Notes:

- Steel and cast-iron items on dry heat applications with temperatures up to 540 °C continuous.

SYSTEM		D
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1	Coat epoxy primer (twin pack, for HDG surfaces)	d.f.t = 75 µm
1	Coat polyurethane enamel (twin pack)	d.f.t = 50 µm
		Total d.f.t = 125 µm

Applied to:

- Hot-dip galvanized steel pipes, handrails and stanchions, guards, steelwork, etc.

SYSTEM		E/1
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1	Coat wash primer to SABS 723	d.f.t = 10 µm
1	Coat zinc chromate primer to SABS 679 Type 1	d.f.t = 40µm
1	Coat universal undercoat to SABS 681	d.f.t = 35µm
2	Coats silicone urethane gloss enamel top coat to colour code	d.f.t = 70µm
		Total d.f.t = 155µm

Notes:

- If the specified dry film thickness of the zinc chromate primer of 40 µm is not achieved with one coat, an additional coat shall be applied.
- The paints used shall be suitable for internal and external use.
- An alternative priming and undercoat system of superior corrosion resistance may be used.

SYSTEM		E/2
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1	Coat phenolic based primer	d.f.t = 20µm
1	Coat universal undercoat to SABS 681	d.f.t = 35µm
2	Coats machinery enamel	d.f.t = 50µm
		Total d.f.t = 105

µm

Notes:

- The paints shall be suitable for internal and external use.
- The paints selected shall not be damaged by oil spillage or grease and shall be reasonably chemical resistant.

SYSTEM

E/3

1	Coat zinc chromate self-etching wash primer to SABS 723	max. d.f.t =	10µm
1	Coat zinc chromate primer to SABS 679 Type 1		
1	Coat universal undercoat to SABS 681	d.f.t =	35µm
2	Coats single pack urethane gloss enamel	d.f.t =	60µm
			Total d.f.t = 145

µm

Notes:

- All paints shall be suitable for internal and external use.
- If the specified dry film thickness of the zinc chromate primer of 40 µm is not achieved with one coat, an additional coat shall be applied.

SYSTEM

E/4

1	Coat water borne vinyl-based primer; Dulux Corrocote 3 or equiv.	d.f.t	=	40µm
2	Coats Acrylic Semi-Gloss top coats; Ameron 234 or equivalent	d.f.t	=	100µm
			Total d.f.t =	140µm

Applied to:

- General use on hot-dip galvanized surfaces.

SYSTEM

E/5

1	Coat twin pack epoxy zinc chromate primer	d.f.t	=	30µm
2	Coats acrylic semi-gloss coats; Amercoat 234 or equal approved	d.f.t	=	100µm
			Total d.f.t =	130µm

130µm

SYSTEM

E/6

1	Coat epoxy strontium chromate primer	d.f.t	=	25µm
2	Coats Dulux Silthane Gloss enamel	d.f.t	=	60µm
			Total d.f.t =	85µm

85µm

Note:

- The paints used for this system must be suitable for a continuous operating temperature of 120°C or higher.

SYSTEM

F

1	Coat vinyl copolymer polyester	Total d.f.t	=	100µm
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Applied to:

- Steel floor grating.

SYSTEM - FUSION BONDED EPOXY

This is a water resistant, non-toxic and non-tainting, fusion bonded epoxy pipe coating in accordance with SABS 1217. The material used shall be of Type 2; i.e. a thermosetting powder-coating material. The finished coating shall have a thickness of 300 µm and no reading shall be less than 200 µm.

Note:

- The Contractor shall execute holiday detection over the full surface in accordance with SABS 1217.
- The items to be coated shall be prepared in accordance with Clause 4.1.1 of the SABS 1217 and shall have edges ground to a radius of curvature of at least 3 mm.
- The surfaces to be coated shall be prepared in accordance with Clause 4.1.2 of SABS 1217 and shall be blasted to a preparation grade of Sa 3.
- Pre-heating is needed to achieve the required coating thickness.

Applied to:

- Immersed objects, cast iron valve bodies, pipework, etc.

SYSTEM – HOT-APPLIED THERMOPLASTIC

This is a synthetic thermoplastic polyamide, Rilsan or equivalent, which shall be applied by dipping the hot object into a fluidised bed of the polymer. The coating shall be executed in accordance with the supplier's recommendations. The finished coating shall have a thickness of 300 µm and no reading shall be less than 200 µm.

Acceptable Materials and Suppliers

The table below lists acceptable materials and suppliers. In all cases, equivalent materials and suppliers are acceptable.

GENERIC	MATERIAL/SUPPLIER
Hot-dip galvanizing	Hot dip galvanisers shall hold the SABS certification mark for SABS 763.
Powder Coating	Plascon epoxy/polyester powder: CEP series, Dulux Sigmalining FBE 27.
Universal Undercoat	Dulux Sigmarine Undercoat, Chemrite Carboline GP-64 Undercoat, Plascon Plasconamel 189 Undercoat.
High-Gloss Alkyd Enamel	Chemrite Carboline AD-51 Finish, Plasconamel 1000 Finish, Dulux Sigmarine BTB Enamel.
HB Epoxy Primer: Twin Pack	Plascon Plascotuff HB Epoxy MLE series, Dulux Sigmacover CM Miocoat, Chemrite Carboline 888.
Epoxy Primer: Twin Pack (for hot-dip galvanized surfaces)	International Interguard 269, Dulux Sigmacover Primer, Carboline 193 Primer.
Polyamine/amide Cured Epoxy sealer/coating: Twin Pack	Chemrite Carboline Rustbond Penetrating Sealer, Plascon Plascoguard Copon EA3 Primer, Dulux Sigmarite Sealer.
Epoxy Tie Coat	Dulux Sigmarite Sealer (used soon after primer application), Dulux Sigmacover CM Miocoat (where there is a delay after primer application), Chemrite Carboline 193, Plascon Plascosafe 18 Primer.
Low solvent, high solids, Polyamine/amide Cured Epoxy: Twin Pack	Plascon Plascoguard Copon KSIR88, Dulux SigmaGuard EHB, Ameron Amercoat 385, Chemrite Carboline 891.
Polyamine/amide Cured Coal Tar Epoxy: Twin Pack	Dulux Sigma TCN 300, Chemrite Carbomastic 200, Ameron Amercoat 78HBB.
Solvent Free Epoxy repair coating	Plascon Plascoguard Copon Hycote 151, Dulux SigmaGuard CSF 75.
Aluminium Filled Epoxy: Twin Pack	Ameron Amerlock 400 AL, Carbomastic 15, Sigmacover Aluprimer.
Zinc Phosphate Primer	Chemrite Carboline GP-18 Primer, Plascon Plascoprime 183 HB, Dulux Bildphos M10 Primer.
Inorganic Zinc Silicate	Plascon Plascozinc 233, Dulux Sigma Tornusil MC60, Chemrite Carbozinc 11, Ameron Dimetecote 11.
Modified Silicon	Chemrite Carboline 4631, Plascon Plascotherm Silicone 540 – Aluminium, Dulux Sigmatherm Silicate.
Silicone Acrylic	Plascon Plascotherm Silicon – Acrylic 200 T, Chemrite Carboline 1248.
Polyurethane Enamel: Twin Pack	Dulux Sigmadur Gloss, Chemrite Carboline 134 over polyamine/mide coatings, Chemrite Carboline 133 HB over zinc coatings, International Interthane 990, Plascon Plascothane Recoatable Enamel CPC Series, for two-coat systems, Plascon Plascothane Recoatable Enamel CPQ Series, for single coat systems.

FASTENERS

Standards

Bolts and nuts shall be hexagon head type complying with SABS 135 with threads of the coarse pitch series. Allen head screws of any type shall not be used without the Engineer's written consent.

Fasteners M12 and Smaller

All fasteners M12 and smaller shall be manufactured of grade 316 stainless steel.

Fasteners Larger than M12 - in Corrosive Areas

All fasteners in corrosive areas shall be manufactured of 316 SS. Corrosive areas shall be taken to include any moist or wet area such as in and above settling tanks, in or in the vicinity of open channels, where a continuous spray can be expected and all internal and external areas in the vicinity of the inlet works of a wastewater treatment works. All fasteners embedded in brick, concrete or soil shall also be of 316 SS.

Fasteners Larger than M12 - Non-Corrosive Areas

Fasteners larger than M12 which are in non-corrosive areas shall, except when specified otherwise, be hot-dip galvanized.

High Tensile Bolts

Where high tensile bolts are required by the design, they shall be hot-dip galvanized and painted. The bolt holes and crevices shall be filled and sealed prior to painting.

Material Compatibility

Fastener material shall always be of equal or better corrosion resistance than the items being fastened, e.g. 316 stainless steel bolts must be used to fasten together 316 stainless steel fabrications or flanges.

Washers

Washers of similar material to the bolts shall be provided under each nut and setscrew head. Multiple washers or shims shall not be used. Spring washers or other approved locking arrangement shall be used on all fasteners subject to vibration.

Anti-Seize Compound

Before assembly, threads shall be treated with a nickel based, anti-seize/corrosion protection compound; Chesterton 725: Nickel Anti-Seize Compound, or equivalent. The thread shall be treated in the area under the final position of the nut. Compound on the exposed thread shall be cleaned off after installation. If it is found during inspection that compound has not been applied, the Contractor shall disassemble all fasteners and comply with this requirement.

Thread Projection

Bolt threads shall project between 1 and 6 mm from the head of the nuts when fixed. Longer projections will only be allowed if the Contractor can show that bolts of a more suitable length are not manufactured.

Corrosion Protection

After installation the exposed surfaces of bolts not made of 316 stainless steel shall be coated as for the items being fastened. If the use of Allen head or similar fasteners has been approved by the Engineer, the recessed heads shall be filled with a suitable non-hardening sealing compound.

ANCHOR FASTENERS

Type and Material

All anchor fasteners shall be of grade 316 stainless steel.

Anchor fasteners for water retaining structures and for brickwork shall be of the chemical anchor fastening type. Anchor fasteners for other applications may be of the expanding type or chemical anchor type.

Hook Bolts

Grade 316 stainless steel hook bolts shall be supplied and grouted by the Contractor into pockets which will be provided in the concrete structure in accordance with the information to be supplied by the Contractor. The grouting products shall be used strictly in accordance with the manufacturer's instructions.

Alternative Anchor Bolts

The use of 316 stainless steel "Hilti Kwik Bolt" stud bolts or similar may be used as an alternative where approved by the Engineer. If steel reinforcing bars are encountered while the holes are being drilled, the Contractor shall knock a hole in the concrete around the steel and grout in a stainless-steel hook bolt as described above.

Through-Bolt Anchors

Where machinery is anchored by studs or bolts which extend through the supporting structure and is therefore fastened down with the use of nuts from both sides, these, together with associated washers and brackets, shall also be of grade 316 stainless steel.

Anti-Seize Compound

All threads shall be coated with an approved nickel-based, anti-seize/corrosion protection compound before assembly.

GRID FLOORING

All grid flooring shall be Mentis type RS40 or equal approved with bearer bars across the shorter span. The depth of bearer bars shall not be less than 30 mm with a bearer bar pitch of not greater than 40 mm. Panels are to be set level and fixed down in angle frames so as to prevent rocking. All cut-outs in grid flooring for pipes, valve spindles and the like are to be banded and made before any corrosion protection is done. The edges of removable grid access covers must also be banded.

Grid flooring and frames shall be hot-dip galvanized after fabrication. Painting is not required unless called for in the Detailed Specification.

Where grid flooring bears onto painted surfaces, strips of rubber insertion material shall be secured under the grid flooring to protect the paint.

The fixing clip set (saddle clamp and locking plate) shall be of hot-dip galvanised steel but all fasteners shall be of grade 316 stainless steel.

GUARD RAILING

Guard railing shall be provided in accordance with legislated requirements and shall be provided generally in positions where the vertical change in level is 1 000 mm or greater.

Guard Railing for Equipment Installations

Guard railing shall comply with SABS 0104.

The following specific requirements shall be complied with:

- a) All guard railing shall be hot dipped galvanizing and shall comprise hand and knee rails not less than 32 mm diameter and stanchions spaced at not more than 1,8 m except where specifically directed otherwise in writing by the Engineer.
- b) On platforms, walkways, landings, or around dangerous areas the vertical height, measured from the top of the handrail to the floor or surface, shall be at least 1 000 mm.
- c) On stairways and fixed ladders, the rails shall be parallel to the strings, and the vertical height, measured from the top of the hand rail to the nosing of the tread, shall be at least 900 mm.
- d) For applications covered by this Specification, the rails and stanchion shall withstand, without permanent deflection, a proof force of 890 N and 1780 N respectively, applied at any point and in any direction. Contractors shall provide proof that their guard railing has been tested and withstands these loads.
- e) Stanchions and rails shall be smoothly finished and free from sharp corners, edges and projections which may injure persons or damage clothing. Stanchion bases shall have the corners rounded or sheared off.
- f) Railing, if tubular, shall be joined using the slip-jointing method with separate and neatly fitting tubular inserts fitted into the railing bore. If used, pins shall have their ends peened over and smoothed or, if taper pins are used, shall be filed off flush with the rail. The joint shall withstand the loads specified above when situated in any position including centrally between two stanchions. Joints shall preferably be located inside the stanchion balls. All joints shall be sealed.
- g) Railings shall be ended off with positively fixed (pinned) closure bends. At corners, short radius bends with stanchions on both ends shall be employed or, alternatively, stanchions specifically designed for such a position shall be employed. No sharp endings will be permitted.
- h) Stanchions shall generally be base-mounted to suit the arrangement requirements and shall be of solid or welded construction. Welding shall be compatible with the material, shall not impair the strength or corrosion resistance of the material, shall be continuous and shall be smoothly finished and then passivated.
- i) Stanchions shall be self-draining to suit the mounting arrangement.
- j) Holes for the rails to go through the stanchions shall have a diametral clearance not exceeding 1 mm but preferably 0,5 mm. On stairways with stanchions vertically mounted, the hole shall be angled to suit and shall accurately fit the angled rail with the abovementioned clearances. The crevices caused by rails passing through the stanchions shall be sealed.
- k) Stanchion feet which are attached to metallic surfaces shall have minimum dimensions of 150 mm X 60 mm. Two fasteners of minimum size M16, shall be used to attach the foot. Foot material thickness shall be not less than 8 mm. Neatly fitting packing, Denso tape or equivalent, shall be fitted under stanchion feet to prevent the formation of crevices.

- l) Stanchion feet which are attached to non-metallic surfaces shall have minimum dimensions of 150 mm X 150 mm. In instances where the horizontal surface to which the foot is to be fastened is less than 150 mm wide, the foot shall be designed to be seated on at least two surfaces. Four fasteners of minimum size M16, shall be used to attach the foot to the concrete. Foot material thickness shall be not less than 10 mm. Non-shrink, cementitious grout shall be applied under the foot just prior to final tightening of nuts.
- m) Stanchion feet shall be epoxy-coated.
- n) A nickel-based, anti-seize compound shall be applied to all threads before fastening.
- o) All components shall be supplied in the pickled and passivated condition which may also be polished. All surfaces must be uncontaminated and unmarked to ensure maximum corrosion resistance. A manufacturer's test certificate shall be provided for each batch of stainless steel giving the chemical analysis of the material.
- p) Inserts for internal slip joints may be of non-corrosive material using steel reinforcing provided the steel is completely enclosed.
- q) Where kickplates are required by legislation, these shall extend to 150 mm above the walkway level.

Guard Railing in Public Places

The requirements for guard railing at equipment installations shall also apply for guard railing for public places. The following specific requirements must also be complied with:

- a) The structural design shall be done in accordance with the requirements of SABS 0104.
- b) No opening in guard railing installed in public places shall allow the passage of a ball of 100 mm diameter.

PERMANENT LADDERS AND STAIRS

General

Permanent ladders shall comply, primarily, with the requirements of the Occupational Safety and Health Act and, secondarily, with BS 5395. Stairs shall comply with BS 5395, Part 3.

Unless other materials are specified, ladders and stairs shall be of carbon steel and hot-dip galvanized after all fabrication has been completed.

Permanent Ladders

Ladders shall comply with the following detail design aspects:

- (a) Access points to the head of ladders from platforms and walkways shall be protected by self-closing gates or by chains.
- (b) No part of the ladders shall project into the passageway.
- (c) The width between strings shall be between 380 mm and 450 mm.
- (d) A minimum clear space of 230 mm must be allowed behind the rungs.
- (e) The diameter of the rungs shall be between 20 mm and 50 mm.
- (f) Additional rungs shall be provided in the same horizontal plane as the top rung in order to close the gap between the platform and the ladder. Sufficient rungs shall be provided to ensure a maximum gap of 75 mm. These top rungs shall be at the same level as the floor or platform to which access is being provided.
- (g) Strings shall be formed from flat bar.
- (h) The vertical distance between the ladder support brackets shall not exceed 1 800 mm.
- (i) The strings shall extend to 1 100 mm above the floor or platform and shall be matched with any guard rail protections at this level. Connections between hot-dip galvanized steel ladders and hand guard railing shall be bolted. Unless laterally supported by the guard

- rails, these strings shall be supported by vertical structural sections (not flat bar) whose footings shall comply with this Specification for guard rail stanchion feet.
- (j) All rises in a flight shall be uniform and the surface of the top rung shall be level with the top platform or landing. The height chosen for the rise shall be between 225 mm and 255 mm.
 - (k) Except on chimneys, the height of a ladder should not exceed 6 000 mm. Greater heights shall be provided with intermediate landings between each 6 000 mm ladder section.
 - (l) If the height between start and end levels is over 4 000 mm, the ladder shall be fitted with a safety cage. The safety cage shall extend at least 1 000 mm above the higher landing. The cage shall be no more than 700 mm away from the plane of the rungs. The cage shall comprise at least seven vertical elements.
 - (m) Anchor bolts shall be of grade 316 stainless steel and shall be no smaller than M16.
 - (n) Strings, rungs and anchor brackets shall be of solid structural sections (e.g. flat bar, round bar, square bar, angles, etc.) and no hollow sections will be accepted for any part of the ladder.

Stairs

Stairs shall comply with BS 5395.

PIPEWORK

Pipes and Fittings

- a) **STEEL PIPE - GENERAL DUTIES:** Steel pipes for general non-corrosive, non-abrasive duties for liquid, air and gas shall be as follows:
 - Up to DN 150 - SABS 62 medium class
 - Over DN 150 - SABS

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Unless otherwise specified, steel pipework and fittings shall be hot-dip galvanised and painted.

- b) **STEEL PIPEWORK – DESIGN:** Pipework up to DN 600 shall be in accordance with SABS 1476. Pipework for the conveyance of water shall, in addition, comply with CCT-WS 11 Standard Specification for Steel Pipe, Fittings and Specials.
- c) **STAINLESS STEEL PIPEWORK:** Stainless steel pipework shall be to ASTM 312. Schedule 10 pipes and fittings shall be used except where otherwise specified.
- d) **STEAM PIPEWORK:** Steam pipework smaller than DN 50 shall be of 316 stainless steel to ASTM A-312 Schedule 40 or approved equal. Steam pipework DN 50 and larger shall be manufactured to SABS 62 heavy class, ANSI B36.10 STD/Schedule 40 or to BS 1600 Schedule 40. Steel pipework shall be supplied with a suitable temporary corrosion protection both internally and externally in order to prevent corrosion during the storage, installation and pre-commissioning period. A primer like Plascon SNK 2, phenolic modified polyvinyl butyral self-etch primer, would be suitable.
- e) **HYDRAULIC & OIL PIPEWORK:** Hydraulic pipework shall be to BS 778 or equal. All hydraulic and oil pipes and fittings shall be thoroughly degreased, descaled and cleaned internally and externally after fabrication by abrasive blasting or pickling, thoroughly cleaned and rinsed, dipped in a hot iron phosphate solution, and coated internally with a corrosion inhibiting, oil soluble preservative. After treatment and drying all openings shall be sealed until the pipes are installed.
- f) **BUTT WELD FITTINGS:** Steel butt welding pipe fittings shall be to ANSI B 16.9, BS 1965 or BS 1640 of the same schedule as the pipework or heavier. Butt weld fittings in stainless steel shall be to ASA B 36.19 for schedule 5S and 10S and ASA B 16.9 for schedule 40S and 80S. Alternatively, fittings may be to BS 1640.

- g) **MALLEABLE CAST IRON:** Malleable cast iron fittings shall be to SABS 509.
- h) **CAST IRON:** Cast iron pipes and fittings shall comply with BS 2035 (Class D) and shall be pressure tested in accordance with Clause 12 of that Standard. The requirements of the Standard's Clause 6 regarding freedom from defects and casting appearance and Clauses 8, 9 and 10 regarding casting accuracy will be strictly applied. The requirements of the Standard with regard to protection and flanges shall be modified to comply with this Specification. Also refer to Clause "Castings" of this Specification.
- i) **COPPER PIPES:** Copper pipes shall be to BS 2871 or approved equal.
- j) **PLASTIC PIPEWORK:** Polyethylene or Polypropylene pipes shall comply with SABS 533 and SABS 1315 respectively and shall carry the SABS mark. The contractor manufacturing and installing the pipework shall satisfy the requirements of SABS ISO 9002. PVC pipework is not acceptable except where specified.

An operating life of 50 years shall be designed for and appropriate derating factors shall be applied to suit the application. The rated maximum working pressure at operating conditions of the class of pipe selected shall be not less than 1,5 times the actual maximum operating pressure. If the material used has insufficient resistance to solar radiation (U.V. light) for the application, suitable protection must be provided to achieve the required life.

Note that nominal bores and pipe diameters specified must be regarded as the minimum inside diameter.

Pipework Design

- a) **PIPE TYPE AND MATERIAL:** The type and material of pipe to be used will be given in the Detailed Specification.
- b) **PIPE DIAMETERS:** Unless otherwise specified in the Detailed Specification, pipe diameters shall be based on the following velocities. The velocities shall be based on the compressed volume at the operating pressure in the case of steam, air and other gases. Valves and other ancillaries shall generally be of the same nominal diameter as the pipe. Non-standard sizes shall not be used.

FLUID	FLUID FLOW [ℓ/s]			
	0-2,5	2,5-15	15-100	100-500
	ALLOWANCE FLOW VELOCITY [m/s]			
<u>LIQUID</u>				
GRIT FREE:	0.75 max	1,25 max	1,5 max	2 max
HIGH SOLIDS OR GRIT:		0,8 min	1 min	1 min
		1,5 max	1,75 max	2 max
<u>STEAM</u>	10 max	15 max	20 max	25 max
<u>AIR AND GAS</u>				
above 10 kPa	5 max	8 max	10 max	12 max
below 10 kPa	2,5 max	3 max	4 max	5 max

* Grit free liquids include potable water, final effluent, centrate, supernatant, etc. Liquids considered having high solids content will include raw sewage, sludge and grit slurry.

If anomalies occur within the same system using the above table, the larger pipe diameter shall generally be used.

- c) **COUPLING ARRANGEMENT:** Screwed fittings may be used on DN 50 and smaller provided that sufficient unions or flanges are provided for disassembly and removal of equipment. Reducing sockets and not reducing bushes shall be used where required.

All steel pipes larger than DN 50 shall be flanged or fitted with pipe couplings as applicable.

Suitable flexible couplings shall be incorporated wherever necessary to facilitate maintenance or isolate vibration. A flexible pipe coupling shall be provided on each pump suction. Flexible couplings shall be adequately restrained by harnesses as specified in the Clause "Flexible Pipe Couplings".

- d) **DRAINING, VENTING AND PURGING:** On liquid lines provision shall be made for draining and venting where necessary. Vents shall be provided at all vertical down bends on gravity lines. On gas lines provision shall be made for purging.
- e) **CONDENSATE DRAINS:** Automatic condensate traps with isolating valves and valved by-passes shall be provided at all necessary points including ahead of any globe type valve, orifice plate or concentric reducer in a horizontal line, at each change of level and immediately ahead of the user equipment.

A suitable well of a diameter equal to the pipe diameter with a bottom drain shall be provided at each condensate removal point. Condensate traps and valves shall be accessible, and condensate shall be piped to the nearest drain. Pipework shall be sloped in the direction of flow towards a drain point with a slope of 1 in 150 and care shall be taken to avoid sagging at any point.

- f) **BY-PASSES:** Isolating valves and valved by-passes shall be provided around condensate traps, pressure reducing valves and valves with solenoid or other actuation which do not have provision for manual operation.
- g) **ENCASED PIPES:** Pipework to be permanently encased in concrete, cement or similar shall be of cast iron or 316 stainless steel for steel and stainless-steel pipework respectively. The encased portion must be a separate section flanged both ends with adequate clearance between the wall surface and the flanges. Victaulic type couplings may in some instances be permitted instead of flanges.

Pipe sections through walls below ground or water level shall be provided with a puddle flange the same diameter as a standard flange. The encased area shall in such cases be uncoated up to 30 mm inside the wall surface and coated to Specification from there on.

- h) **ISOLATION:** The layout design shall make provision for isolation and easy removal of mechanical equipment.
- i) **NOZZLES FOR FITTINGS GAUGES, ETC.:** Nozzles on pipework (for installation of gauges, transmitters, drainpipes, cooling water take-offs, air valves, etc.) shall be designed so that the pipework corrosion prevention system is not affected.

Nozzles shall consist of a flanged, welded tee-off of at least 100 mm in diameter, painted internally and provided with a non-corrosive blank flange, e.g. grade 316 stainless steel. The blank flange shall be provided with tapped holes suitable for the equipment installation.

A nozzle on cement-lined, carbon steel pipework shall consist of a flanged, cement lined tee-off (of at least 100 mm diameter) and a non-corrosive blank flange.

Internally painted, small diameter carbon steel nozzles and screwed carbon steel tee-offs are both unacceptable as nozzles. Carbon steel pipework may be provided with small diameter, grade 316 stainless steel nozzles which are welded into the pipework if the Engineer considers this acceptable in the application.

Pipework Installation

- a) **APPEARANCE:** Pipes and fittings shall be conservatively selected to suit the application, neatly installed, straight to line and level, adequately supported and shall operate without vibration.
- b) **VALVE ORIENTATION:** On sludge or raw sewage pipelines, check valves shall, wherever possible, be mounted horizontally and isolating valves with spindles vertical. Valve handwheels shall be arranged so that they are accessible to the operators.
- c) **SUPPORTS:** No external loads shall be placed on items of mechanical equipment such as pumps, compressors, etc. Adequate provision shall be made for expansion and contraction due to variations in temperature or pressure.

A drawing or sample of proposed pipe supports shall be submitted to the Engineer for approval prior to manufacture.

Pipe supports shall be so located that when an item of mechanical equipment is removed, the associated valves and pipework are still adequately supported. Supports shall be provided close to heavy items such as valves.

3 mm thick neoprene strips shall be placed between pipes and supports or clamps to protect the paintwork and limit corrosion. Where roller or sliding supports are used to accommodate movement, suitable wear blocks shall be fixed to the pipe to prevent damage.

Where the Engineer approves the use of concrete pipe supports to be built by a civil contractor under a separate contract, these shall be constructed after installation of the pipework and temporary supports shall be provided by the Contractor in positions which will not interfere with the construction of the concrete supports.

- d) **PRESSURE TESTIN:** All pipelines shall be pressure tested to 1,5 times maximum working pressure. This shall be done before covering up the pipeline in any way where applicable and shall be witnessed by the Engineer.

FLANGES

- a) **STANDARDS:** All standard flanges shall comply with SABS 1123. For flange sizes not included in the SABS, BS 4504 shall be used. Cast iron flanges and their mating flanges shall have flat faces. The flange table shall be as specified or, if not specified, selected to suit the maximum possible operating pressure but not less than Table 1000. Drilling and installation of flanges shall be "off-centre".
- b) **FLANGE FIXING:** Flanges DN 50 and smaller may be of the screwed-on type. Metal flanges above DN 50 shall be welded on in accordance with BS 806 Type 6 unless otherwise agreed or specified.
- c) **MACHINING OF FLANGES:** All flanges shall be machined on the sealing face. Flanges cut from plate shall also be machined on the bore and outside diameter. Cast iron flanges shall also be machined or spot faced on the back of the flange to ensure a flat bearing surface for the fastener's head or nut and washer. All edges, including bolt-holes, shall be chamfered or rounded to a 2 mm radius.
- d) **BUTT FLANGES:** If the use of a loose hot-dip galvanized butt flange arrangement with stainless steel pipework is specified or approved by the Engineer, such arrangement and design shall comply with BS 4504 Table 6/6 or 10/6 as appropriate. The butt-welded shouldered end for the pipe may be rolled from hot rolled stainless steel angle section. The hot-dip galvanized butt flange must be electrically insulated from the stainless-steel pipework.

- e) **RECTANGULAR FLANGES:** The use of square or rectangular flanges shall be avoided and will not be accepted for pressures above 100 kPa. The thickness of flanges designed for positive or negative pressures between 20 and 100 kPa shall be not less than 75 % that of a circular flange of equivalent nominal opening area manufactured to Table 600 of SABS 1123. For pressures 20 kPa and below the flange thickness shall be to the Engineer's approval. Bolting shall in all cases be to the Engineer's approval.
- f) **GASKETS:** The jointing material used on flange joints shall be of rubber or compressed asbestos fibre at least 3 mm thick complying respectively with BS 2494 or BS 1832, as applicable. Full face gaskets shall be used for full face flanges. Inner bolt circle gaskets shall be used on raised face flanges and when clamping items such as wafer type valves between flanges inside the bolt circle. Properly designed O-ring seals are also acceptable.

FLEXIBLE PIPE COUPLINGS

Coupling Types

Where movement or misalignment must be allowed for, or if necessary for any other reason, rubber expansion joints may be used if approved by the Engineer. The flexible material used for rubber expansion joints shall be chosen specifically for maximum resistance to bursting.

Viking Johnson couplings and flange adaptors, or equivalent, may also be used if approved by the Engineer and these shall be supplied without centre register unless otherwise specified.

Flexible couplings for cast iron pipes and, where specified, for asbestos cement pipes, shall be of the cast iron short or long collar type. Flexible couplings for steel or stainless-steel pipework may be of the "Victaulic" type or approved equal for grooved or shouldered end pipes.

Couplings for plastic pipes shall be of the clamp type employing buttressed pipe ends.

Pipe Ends

Pipe ends shall be prepared strictly in accordance with the coupling manufacturer's recommendations. Where machining is required, as in the case of cast iron pipes, the length of machining on each pipe shall be approximately equal to the total length of the coupling to ensure that the coupling can be separated for pipe removal.

Supports and Anchors

Pipework using flexible couplings shall be supported and anchored strictly in accordance with the coupling manufacturer's recommendations. Harnesses against separating forces shall be provided where appropriate to the approval of the Engineer. Where this restraint is not provided by the layout, other neat and positive means of harnessing shall be provided. A system incorporating additional flanges or lugs cast on in the case of cast iron, or welded on for steel, and connected by tie bars or positively fixed to anchors, will be accepted. Systems relying purely on friction will not be acceptable.

Corrosion Protection

Cast iron couplings shall be painted. Steel couplings for gas applications shall be hot-dip galvanized. Steel couplings for fluid applications shall be coated in accordance with System – Hot Applied Thermoplastic or System - Fusion Bonded Epoxy.

Metal backing flanges for rubber expansion joints shall be of stainless steel or hot-dip galvanized steel.

Fasteners

Fasteners for Viking-Johnson type couplings shall be of grade 316 stainless steel. This includes coupling studs, stub studs (i.e. studs welded to the flanges of flange adaptors), washers and nuts.

Fasteners for other couplings shall be of stainless steel or hot-dip galvanized steel.

Underground Protection

When couplings are part of a buried pipeline the couplings shall be enclosed with "Denso mastic" to a smooth finish, wrapped with "Denso tape" and then wrapped with a polythene sheet which is strapped in place. If the operating temperature is likely to exceed 70°C the Denso paste, and tape shall be replaced with a suitable grease or a suitable sealer.

CONDENSATE TRAPS FOR SEWAGE GAS

Not used

FLAME ARRESTERS

Not used

PRESSURE RELIEF AND VACUUM BREAKER VALVE WITH FLAME ARRESTER UNIT

Not used

VALVES FOR LIQUIDS OR GASES

General

The valves to be used on the more common applications are specified below. Where special valves are necessary for special applications, these may be specified in the Detailed Specification but, if not, the Tenderer must select suitable valves and provide details with his tender.

Requirements for All Valves

- a) **CONSTRUCTION AND DESIGN:** Valves shall be designed and constructed to ensure reliable operation after long periods of non-operation.

Valves shall be double-flanged unless unavailable or otherwise specified.

Valves and their method of actuation shall be designed to provide operation under the full pressure rating of the valve.

- b) **OPERATING DIRECTION:** The handwheel, lever, etc. on valves, valve actuators and valve gearboxes to be supplied and installed for the Water Department of the Water and Waste Directorate of the Municipality shall be configured to be anti-clockwise closing unless unobtainable.

All valves supplied and installed shall be clockwise closing.

- c) **POSITION INDICATION:** All valves, including valves with gearboxes and valves with actuators, shall be provided with indication of current position as well as indication of closing and/or opening direction. Valves with configurations which makes this information apparent will be acceptable.

- d) **CORROSION PROTECTION:** The specific application shall be taken into account in the corrosion protection of valves.

Cast iron valve components, including valve bodies, shall be protected with System - Fusion Bonded Epoxy.

- e) **FASTENERS:** Valve and valve gearbox fasteners shall be of grade 316 stainless steel.

Cast Iron Gate Valves with Resilient Seals

- (a) Resilient seal gate valves may be used on raw sewage, raw water, effluent and general duties where some solids may be present but must not be used on high solid applications such as sludge and grit duties.
- (b) The valves shall comply with SABS 664 or SABS 665, Class 10 or higher as required.
- (c) The valves shall be double flanged.
- (d) Valves shall have rising spindles unless otherwise specified or necessary because of space restrictions. Non-rising spindle valves shall be fitted with indicators showing the valve opening position.
- (e) Handwheels shall be of cast-iron.
- (f) Fixing lugs for end of travel limit switches shall be provided
- (g) Handwheel size and construction shall permit easy opening of the gate when subjected to a differential pressure equal to the maximum operating pressure anticipated. Suitable gearboxes shall be fitted to provide easy opening when necessary. These gearboxes shall be grease filled.
- (h) Valves larger than DN 150 shall be provided with bypass arrangements.

Cast Iron Gate Valves (Wedge Gate)

Wedge gate valves shall be used on raw water and treated water duties but shall not be used on raw sewage, raw water, effluent, sludge and general duties where some solids may be present. The valves shall comply with the following:

- (a) The valves shall comply with SABS 664 or SABS 665, Class 10 or higher as required.
- (b) The valves shall be double flanged.
- (c) The material of the body seat and the material of the gate trim shall be of copper alloy or stainless steel.
- (d) The body shall be provided with channel guides and the gate shall be provided with shoes. Guides and shoes shall be of copper alloy or stainless steel and shall guide the gate along the complete travel distance.
- (e) Fixing lugs for end of travel limit switches shall be provided.
- (f) Valves shall have rising spindles unless otherwise specified or necessary because of space restrictions. Non-rising spindle valves shall be fitted with indicators showing the valve opening position.
- (g) Handwheels shall be of cast-iron. Handwheel size and construction shall permit easy opening of the gate when subjected to a differential pressure equal to the maximum operating pressure anticipated. Suitable gearboxes shall be fitted to provide easy opening when necessary. These gearboxes shall be grease filled.
- (h) Valves larger than DN 150 shall be provided with bypass arrangements.
- (i) Valves larger than DN 250 shall be provided with doors for inspection and cleaning.

The valves shall comply with the additional requirements of CMC-WS15:1993 where applicable.

Knife-Gate Valves

- (a) Knife-gate valves must be used on water sludges as well as on primary, waste activated and digested sludge duties. They shall also be used on other high solids application and may be used for duties specified under Clause "Cast Iron Gate Valves with Resilient Seals".
- (b) Valves shall be Insamcor HDH CI STD, or equivalent, with cast iron bodies, stainless steel blades, cast handwheels, and no carbon steel parts.

- (c) Valves for water sludges shall be anti-clockwise closing. Valves for primary, waste activated, and digested sludges shall be clockwise closing.
- (d) Valves shall have chamfered blade edges and resilient body seals and may have either rising or non-rising spindles. Gate position indication shall be provided if the overall design does not make this apparent. The blade shall be loaded through its central plane during opening and closing and this shall be achieved by using a clevis link or similar. Blade scrapers shall be incorporated to protect the body seal and valve chest. As the valve is opened, the scrapers shall clean the blade surfaces before these contact the body seal. The scrapers shall be of a non-elastomeric, non-metallic material and shall be designed to cause minimal damage to the blade.
- (e) Valves shall be droptight in either flow direction. Suitable sealing shall be provided to prevent leakage from the valve and it shall be possible to adjust these seals while the valve is in line under pressure.
- (f) Internal and external surfaces of the valve body shall be protected with a water resistant, non-toxic and non-tainting, fusion bonded epoxy pipe coating in accordance with System - Fusion Bonded Epoxy.
- (g) Valves shall be double-flanged and shall suit the standard flange rating but may incorporate drilled and tapped fastener holes (the type of valve which is clamped between two flanges will be considered for acceptance only in positions where it is very likely that the pipe or flanged item on either side will never have to be removed or if isolation will not be necessary if it is removed). Fasteners may be studs or setscrews manufactured to suit the tapping depth.

Waterworks Type Butterfly Valve

- (a) **For use on raw and potable water duties.**
- (b) **These** shall comply with SANS 1849

Resilient Seal Butterfly Valves

- (a) For use on air, gas and clean liquid duties.
- (b) Butterfly valves shall be of the resilient seal type with suitably lined cast iron body and a lined or 316 stainless steel blade.
- (c) Shafts and fittings shall be of stainless steel and bearing bushes of Teflon or similar. Seals shall be selected to suit the application. No carbon steel components shall be permitted internally and externally such components shall be properly protected.
- (d) Valves shall be air, gas and watertight when closed.
- (e) Hand lever valve actuation with a locking system for incremental valve setting from fully shut to fully open shall be provided for valves up to and including DN 200. Valves larger than DN 200 shall be equipped with robust, weatherproof grease-filled gearboxes with an indicator to show the degree of valve opening.
- (f) For normal usage, the valves may be of the type which is clamped between two flanges. Where it is necessary to remove equipment on either side for maintenance purposes, suitable spacer pipes must be provided or the valves shall be flanged and provided with drilled and tapped holes.
- (g) The valves shall be installed with horizontal disc shafts.

Bronze Isolating Valves

- (a) **May be used for isolating duties on clean air and liquid duties up to DN 50.**
- (b) Bronze gate valves shall be to SABS 776. Ball or plug valves of appropriate construction may also be used where preferred.

Rubber Diaphragm Valves

- (a) To be used on sewage, sludge and other dirty or corrosive liquid duties requiring valves up to DN 80. May also be used on clean liquid duties.
- (b) Rubber diaphragm valves shall preferably be of the straight through type.

- (c) This type of valve shall not be used on the suction side of pumps or on any line subject to vacuum.

Needle Valves (above DN 150)

Needle valves, VAG Plunger Valve or equivalent, shall be used for the regulation of flow and/or pressure in pipelines containing water where the size is DN 150 or greater unless this is overridden by the requirements of the Detailed Specification. The configuration shall be double-flanged with co-axial flanges unless otherwise specified.

The seal seat and associated downstream parts shall be selected to prevent any cavitation for the application. Such parts shall be of stainless steel or copper-based alloy.

Telescopic Overflow Valves

Telescopic overflow valves, (Fulton, or equivalent), shall be vertically mounted and shall be specifically designed for the purpose intended.

Operation shall be by handwheel mounted on an independently mounted headstock. Rising spindles are preferred. The outer tube shall be flanged and bolted to a similarly flanged vertical pipe. The inner tube shall incorporate a conical bellmouth. The bridge connecting the inner tube to the valve's spindle shall be attached to the outside of the bellmouth in order to limit the effect of fouling rags, etc. The spindle shall be of grade 316 stainless steel or better. The outer tube and inner tube shall be of 3CR12. The headstock and handwheel shall be of painted cast iron or painted 3CR12.

CHECK VALVES

General

A shut-off valve shall be installed downstream of each check valve.

The check valve installation shall ensure that flaps are able to open fully without being impeded by, for example, a shut-off valve, bend or pipework internal lining. Where a check valve is located close to another valve, an intervening spool piece with a minimum flange-to-flange length of 1,5 times the valve diameter shall be provided.

Bronze swing type check valves may be used for pipework up to DN 50.

Check Valves for Water

Check valves for treated water and raw water duty shall be of the double-flap, positive-closing type (Stockham Duo-Chek II, or equivalent).

Bodies shall be of cast-iron or cast-steel. Flaps shall be of the light, leaf type, shall be of bronze or stainless steel with machined sealing faces, shall be specifically designed to be non-sticking, and shall have teflon bearing washers. Seals shall be of resilient material. The axis of rotation of the flaps shall be vertical, pins shall be of 316 stainless steel and closure shall be initiated by stainless steel springs, suitably rated for the duty so that closing is initiated prior to the onset of reverse flow.

Positive, external indication of the position of both plates shall be provided.

Swing Check Valves

Swing check valves shall be used on all sewage, sludge or similar applications.

Swing check valves shall be flanged, shall be of all iron construction suitable for a working

pressure of at least 1 000 KPa, and shall be fitted with a side lever and adjustable weight. Orientation of the valve installation shall comply with the manufacturer's recommendation.

AIR VALVES

General

Air valves for water shall be of the non-slamming type, Vent-O-Mat or equivalent.

Air valves for sewage and similar duties shall be specifically designed for the application.

Arrangement and Installation

Air valves shall be installed above pockets designed to collect air. The pockets shall be designed in accordance with the requirements for nozzles in the Clause "Pipework". The diameter of the nozzle shall be at least half the diameter of the parent pipework.

Air valves shall preferably be flanged and shall be provided with isolating cocks.

PENSTOCKS

General

Penstocks shall be of the rising stem configuration if feasible. If this is not feasible, non-rising stems are acceptable.

Design

Penstocks shall be designed to be operated under full design pressure for both manual and power actuated operation. The headstock beam shall be designed to accommodate the door opening and closing forces with no visible deflection.

A system of adjustment shall be provided for ensuring that the penstock door is held against the seal correctly. Side wedge door adjusters shall be provided. Top and bottom wedge door adjusters shall be provided where required by the installation.

The door shall slide between polymer, elastomer or non-ferrous alloy materials. Direct contact between the door and the frame is not acceptable.

Wedges, guides, seals, door nuts and drive sleeves shall be replaceable.

Stem guides shall be provided along the length of the stem. The spacing between them shall not exceed the height of the door.

Power actuated penstocks shall also be provided with manual operation by handwheel.

Materials

The penstock door and frame shall be of cast iron or grade 316 stainless steel.

The door guides, seals, door nut and drive sleeve shall be of polymer, elastomer or non-ferrous alloy materials.

All fasteners, muff couplings and stem adaptors shall be of grade 316 stainless steel. Universal joints shall be of stainless steel and shall be provided with rubber gaiters for protection.

Copper alloy seals shall not be used on sewage applications.

Fabrication

Fabrication of stainless steel shall comply with the fabrication requirements specified elsewhere in this document. In particular, welding shall be continuous and crevices shall be avoided.

Stainless steel shall be pickled and passivated prior to installation and again before commissioning.

Installation

Penstocks shall be installed by the Contractor using personnel skilled in such installations.

Suitable gaps shall be left for the application of grout. Grout shall be of the non-shrink type and shall be applied strictly in accordance with the manufacturer's instructions. The first penstock to be installed shall be grouted under the supervision of the supplier and in the presence of the Engineer.

Leakage Testing

Leakage testing shall be done under maximum expected pressure and after all installation work has been completed. No leakage between the penstock frame and the structure shall be acceptable.

The acceptable leakage rate shall be:

- 0,015 l/s/m of seating perimeter/3 m pressure head (for off-seating penstocks);
- 0,008 l/s/m of seating perimeter/3 m pressure head (for on-seating penstocks).

VALVE ACTUATORS

General

Valve actuators shall be electric unless otherwise specified.

The direction of operation of the handwheel shall comply with Clause "Valves for Liquids or Gases".

Electric Actuators

Electric actuators shall incorporate three phase motors and shall be specifically matched to the design duty; Rotork IQ, or equivalent, for normal duties and Rotork IQM, or equivalent, for modulating duties.

Manual operation at the unit is required unless otherwise specified.

The actuator motor and gearbox shall form one integrated unit. Motors shall be for three phase, 400 Volt, 50 Hz supply, shall be Class F insulated (or better) and shall have an embedded thermostat for overload protection. The complete unit, including installation work, glands and controls shall be ingress protected to IP 68 unless otherwise specified.

In instances in which the opening or closing period is specified (e.g. to avoid water hammer) this period shall be achieved, without pulsing, by incorporating a suitable gear ratio to allow the motor to operate from fully open to fully closed without stop/starts. If it is not possible to achieve the specified duty without pulsing, the actuator/gearbox/valve arrangement shall be designed to

minimise frequency of motor switching and all design parameters shall be submitted to the Engineer for approval.

For open/shut duties, actuator torque rating shall be at least 200% of the start-opening or shut-off torque, whichever is higher, specified by the valve manufacturer for this application (after the gearbox mechanical advantage has been taken into account).

For modulation duties, actuator torque rating shall be at least 400% of the start-opening or shut-off torque, whichever is higher, specified by the valve manufacturer for this application (after the gearbox mechanical advantage has been taken into account).

All components of the drive shall be designed to prevent backlash.

The actuators shall incorporate the following features:

- ✦ hand operated gearwheel override operation incorporating open/close direction indication.
- ✦ visual position indication at the unit.
- ✦ the actuator shall initiate a trip if:-
 - it does not succeed in moving the valve within a suitable period.
 - the motor windings overheat.
- ✦ the actuator shall provide an impact effect to overcome:-
 - tightly seated valves.
 - an unintended loss of movement.
- ✦ the following information shall be fed back to the control panel or, if applicable, the SCADA system:-
 - valve position.
 - torque on output shaft.
- ✦ it shall be possible to configure the control instructions and interrogate the actuator status without removing covers.
- ✦ the terminal compartment shall be separately sealed from the actuator internals.

Pneumatic Actuators

Actuators shall be designed to match their valves' operating requirements.

Actuators shall be fabricated of non-corrosive materials and shall be mounted using stainless steel mounts and couplings. Fasteners shall be of stainless steel.

Unless the system configuration clearly does not require it, automatic spring-closing shall be provided to ensure that the valve closes (if open) or remains closed (if closed) upon power failure or failure of the air supply. The spring shall be of stainless steel.

Linear actuators shall be provided with stainless steel cylinder piston, cylinder rod and attachments. For open/shut duties, actuator force rating shall be at least 200 % of the start-opening or shut-off force, whichever is higher, specified by the valve manufacturer for this application (after any mechanical advantage has been taken into account). Manual operation, by lever or equivalent, shall be provided in addition to pneumatic operation.

For open/shut duties of rotational actuators, torque rating shall be at least 200 % of the start-opening or shut-off torque, whichever is higher, specified by the valve manufacturer for this application (after any mechanical advantage has been taken into account). Manual operation, by handwheel or equivalent, shall be provided in addition to pneumatic operation.

The air supply to each actuator shall be fitted with a filter-regulator unit with an automatically operating water drain trap.

BASEPLATES

Common Baseplates

Both direct-coupled and belt-driven machines shall be mounted with their drivers on common cast iron or fabricated steel baseplates of rigid construction.

Corrosion Protection

Steel baseplates shall be hot-dip galvanized unless specified otherwise in the Detailed Specification.

Machined Mounting Pads

The baseplate shall incorporate machined mounting pads at the support and fixing positions of each item of plant and equipment to be mounted on the baseplate. On fabricated baseplates this machining shall be done after fabrication, stress relieving (if applicable) and hot-dip galvanizing are complete. The thickness of the solid pads shall be not less than 1.25 times the diameter of the holding down bolts. The pads shall not be provided with threaded holes for machine screws but shall be drilled for inserting through-bolts and adequate provision shall be made for reaching the nut with a suitable spanner. In the period between machining and installation of the equipment, the machined surface shall be protected against corrosion by a removable coating. After installation, a non-hardening compound, Tectyl or equivalent, shall be applied to exposed machined surfaces and to the crevice formed at the foot of the equipment.

The above design may be suitably modified if the Contractor uses a pourable resin based chocking system. Such chocks shall be at least 15 mm thick.

Fasteners

Anchor fasteners shall be of grade 316 stainless steel with threads coated with a nickel-based, anti-seize compound before assembly.

Alignment

Preliminary alignment shall be done at the factory to ensure that the baseplate has been correctly manufactured, but final alignment shall always be done on site after installation and grouting has been completed. Alignment shall be accurate and to the approval of the Engineer and a final alignment check witnessed by the Engineer must be carried out by the Contractor prior to start up.

Shimming

Not more than three shims may be used at any point, and these must be made of a corrosion resistant material.

Jacking Screws

At least two diagonally opposed jacking screws shall be provided for belt tensioning in the case of belt-driven units. Direct-coupled motors above 10 kW shall be provided with jacking screws for horizontal alignment and direct-coupled motors above 150 kW shall be provided with jacking screws for vertical alignment as well. Jacking screws shall be of grade 316 stainless steel.

Grouting

Baseplates shall be so designed and grouted as to eliminate collection points for water or dirt. Except where otherwise approved in writing by the Engineer, all baseplates on concrete plinths shall be fully grouted in. Grouting holes must be provided on baseplates having a continuous top plate. Tapped holes and fixing setscrew protrusions shall be suitably protected.

The material used for grouting shall be a non-shrink, cementitious grout (ABE DuragROUT 1000, or equivalent). ABE Epidermix 324, or equivalent, is acceptable if the Contractor's design requires an epoxy grout to be used.

The initial grouting shall be overseen by the supplier's technical representative.

Soleplates

In applications where baseplates are not practical, machined soleplates, suitably fixed and grouted to the concrete plinths, shall be provided. No machine may be mounted directly onto a concrete base without the use of either a baseplate or soleplate.

GUARDS

Guards shall comply in all respects with the Occupational Safety and Health Act 2005 as amended and the following points shall also be noted: -

- a) Guards are required to cover all moving or revolving components of machinery. Guards which do not adequately cover moving protrusions such as keys, lock-nuts, lockwashers, setscrews, etc., or irregularities such as keyways, will under no circumstances be accepted.
- b) Guards shall be neatly and rigidly constructed and fixed and shall not vibrate or cause noise during operation.
- c) Where expanded metal or similar mesh is used, the mesh opening shall not permit a circular object 10 mm or larger to penetrate.
- d) Mesh shall not be used for chain guards but on belt drives the side of the guard most conveniently sited for inspection shall be constructed of expanded metal or similar. Mesh should similarly be used in other situations where inspection or ventilation is required.
- e) Guards shall completely enclose drives and shall entirely prevent a person from touching any moving protrusion.
- f) Allowance must be made for adjustment on belt guards or where adjustment will be required.
- g) It shall be possible to remove the guard easily for maintenance purposes.
- h) Guards shall preferably be fabricated of 316 stainless steel (uncoated) but may also be hot-dip galvanized, zinc-sprayed or aluminium-sprayed carbon steel, coated to Specification in all these cases. Fasteners shall be M10 or larger and shall be of 316 stainless steel.

ELECTRIC MOTORS

Rating

All electric motors shall be rated for operation on a 3-phase, 4-wire, 400/230-volt, 50 Hz, AC supply at sea level, with an ambient temperature of up to 40°C. Full load speed shall not be more than 1500 rpm. The rated power of the motor shall be not less than 20% more than the maximum power requirement of the associated plant, except where the size of the motor is specified or as otherwise specifically approved by the Engineer. In addition, the motor shall be rated so that, with the method of starting and drive arrangement used, the maximum period for the motor to reach full operating speed shall not exceed 10 seconds.

Specifications

Except as otherwise specified, motors shall be standard squirrel cage or slip-ring motors complying with SABS 948 as amended, with IP55 enclosure and IC0141 cooling, and suitable for

a damp environment. Motors shall be suitable for both "continuous running duty", Duty Class S1, and "intermittent periodic duty", Duty Class S3. Windings shall be copper conductors insulated with Class F material with Class B temperature rise. The motors shall be suitable for 6 starts per hour, two of which shall be consecutive.

Type

The type of motor (and starter if applicable) to be supplied is determined by the requirements of the application specified in the Detailed Specification and by the starting limitations specified in the Electrical Specification. In the absence of such specifications, a standard squirrel cage motor complying with this Clause shall be offered.

Construction

Motor frames shall be of the totally enclosed fan cooled type with cast iron yoke frames and cast-iron end covers. The end covers and yoke shall be properly machined, and each cover shall locate on a spigoted register to ensure concentricity and parallelism. Bearings shall be of grease lubricated roller and/or ball type, provided with grease nipples (with extension tubes where access is restricted) and sealed to suit external use. Motors required for external use shall be fully weatherproofed.

Terminal Boxes

Terminal boxes shall be top mounted wherever possible and arranged for cable entry from either side. The two ends of each stator winding shall be "brought out" to the terminal box. Squirrel cage motors shall be wired to permit both direct-on-line and star-delta starting.

Thermistors

Motors between 55 kW and 150 kW (the latter not inclusive) as well as motors for variable speed drives shall be provided with thermistors embedded in the windings of each phase. The thermistor tails shall be "brought out" to separate terminals mounted near the motor winding terminal block.

RTDs

Motors rated at 150 kW and above, both fixed and variable speed, shall be provided with PT 100 type RTDs. Two RTDs shall be provided per phase winding. All six shall be incorporated into the control system, three to provide monitoring and three to provide high temperature trip.

Heaters

Motors of size 75 kW and above shall be fitted with "pocket" heaters. The heater shall be mounted at the bottom of the motor frame and shall be replaceable without dismantling the motor.

Slip-Ring Motors

Slip-ring (wound rotor) motors shall be of the totally enclosed fan cooled type with stainless steel slip-rings. The slip-rings shall be mounted inboard of the non-drive end bearing and be fitted and keyed to the shaft as a single unit. The terminal box shall be common to both stator and rotor connections.

The brush holders shall be manufactured from fibreglass and be removable from the terminal box as a complete unit. Where the current density in a single brush at the full operating load approaches or is above 80% of the capability of the brush then an additional brush shall be provided in a separate brush box.

Variable Speed Applications

In applications where the motor speed is controlled by supply frequency variation, the motors shall be cooled by a separate, 50 Hz motor driven "piggy-back" fan. This requirement will be waived if the Contractor can provide test results to confirm that the drive and motor design with shaft mounted fan can operate in the application without overheating. This requirement does not apply to submerged motor applications.

Hazardous Locations

When required to suit a hazardous location in terms of SABS 0108 or in terms of this Specification, suitable motors complying with SABS 969 or SABS 970, as appropriate, shall be supplied. The relevant SABS certificates, clearly indicating the location classification in which the machine may be operated, shall be submitted to the Engineer before delivery of the motors. Each motor shall be clearly and permanently marked with the applicable certificate number.

Special Motors

Should the Tenderer wish to offer a different type of motor to those specified to obtain special starting characteristics and/or variable speed, a full technical specification of the motor must be supplied, and such specification shall be for the equipment to a standard at least equal to that of the motors specified above. No item of electrical protection shall be omitted.

Warning

Motor manufacturers must be warned that the motors are to be installed in an extremely corrosive and often damp environment. All motors shall therefore be adequately protected.

POWER TRANSMISSION

Shaft Couplings

Shaft couplings shall, wherever practical, be of the rubber-tyre or rubber compression type with taperlock bushes which shall be keyed to the shafts. After installation the alignment of all couplings shall be checked by the Contractor in the presence of the Engineer or a person delegated by him. Alignment shall be accurate and to the approval of the Engineer.

Spacer couplings shall be used in all cases where this will assist maintenance.

Vee Belt Drives

Vee drives shall be designed to suit the power rating of the motor using service factors appropriate to the driving and driven machinery. Drives shall be designed, manufactured and installed in accordance with BS 3790 and ISO 4184, utilizing taper lock pulleys with taper locks keyed to the shaft.

Where alternative pulley diameters can be selected, preference must be given to the larger pulley diameters to minimize the belt loading on bearings.

Tenderers shall ensure that the bearing arrangements of driving and driven machinery are designed to cope with the loads imposed by vee-belt drives and shall incorporate lay shafts between plummer blocks where necessary. With lay shaft arrangements, Tenderers shall submit their design calculations and drawings for approval by the Engineer. Bearings shall be designed for an L₁₀ life exceeding 100 000 hours. Plummer blocks shall be adequately sealed and shall be fitted with grease nipples. Bearing units incorporating open, shielded bearings are not acceptable.

Motor Driven Gearboxes

Gearboxes shall, unless otherwise specified, be supplied with environmental protection to IP 55.

Gearboxes shall be selected using a service factor of 1.75 based on the drive rating and shall have an efficiency of not less than 96% on two stage reduction and 95% on three stage reduction.

Gears shall be case hardened, profile ground and lapped, helical and spiral bevel gears.

Roller bearings shall be used throughout. Bearings shall be designed for an L_{10} life in excess of 100 000 hours.

The gearbox housing shall be of rigid cast iron construction preferably split in the horizontal plane.

A breather designed to prevent moisture from entering shall be fitted.

Oil-bath gearboxes shall have suitable oil level indicators or dipsticks. Unless otherwise decided by the Engineer, the drain from the gearbox shall be extended beyond the base so that the oil can be easily collected. The drain line shall be of grade 316 stainless steel and shall be fitted with a ball valve and square-head plug.

Each gearbox shall be mounted on machined sole plates fitted with jacking screws to assist with alignment.

MACHINE VIBRATION LEVELS

The mechanical vibration of machines measured at all important points such as bearings shall be lower than that specified as "good" for that class of machine in BS 7854 (ISO 10816).

NOISE CONTROL

Noise Levels

The sound power of any equipment shall not exceed 89 dB(A) (referred to 10^{-1} Watts) unless specifically approved by the Engineer. This is approximately equivalent to a sound pressure level of 81 dB(A) at a radius of one metre from the acoustical centre assuming uniform hemispherical propagation in a free field on a hard floor. In certain instances, a lower noise level may be called for in the Detailed Specification.

Where the Contractor is unable to restrict the noise level of the machines to the maximum specified by the appropriate selection of suitable equipment, e.g. by selecting slow speed or silent type machines, quiet type cooling fans, suitable silencers, etc.; this shall be clearly pointed out by the Tenderer in his Tender so that appropriate steps can be taken at the design stage to counteract the effects of noise.

Acoustic Treatment

Acoustic enclosures are not acceptable unless permitted in this Specification. Acoustic treatment of high noise sources where this can be done without greatly interfering with operation or maintenance must, however, be included where applicable.

When acoustic lagging is called for in the Detailed Specification this shall consist of a 100 mm thick layer of rockwool having a density of 60 kg/m^3 , suitably fixed in place and reinforced to prevent collapse, and covered with 25 mm thick asbestos free plaster having a density of $1\,000 \text{ kg/m}^3$ (I.P. Insultex AF720, or approved equal). The outer surface shall be finished off with scrim cloth before being painted.

It is not necessary to lag flow meters and cast-iron valves on acoustically lagged pipelines.

Components which can move, such as those associated with expansion bellows or flexible couplings, shall be enclosed by an effective acoustic enclosure designed to prevent sound transmission but able to cope with movement without damage.

THERMAL LAGGING

Not

used

BEARINGS

Bearing systems shall be designed to provide safe shut down without damage under normal stoppages as well as electrical supply failure.

LUBRICATION

Grease Lubrication

Grease lubrication is preferred, and all greasing points must be easily accessible.

Equipment with multiple greasing points shall be provided with grease lines which are piped, separately, to a single easily accessible position.

In cases in which motorised lubrication is provided to more than one destination; a distributor shall be provided. The distributor shall be a positive displacement device which ensures equal, successive lubrication to all destinations.

Pipework for grease distribution shall be of stainless steel or non-ferrous metal.

Oil Lubrication

When oil lubrication is necessary, the Tender Prices shall include for the initial oil fill and the first oil change, including flushing, draining and filling, after an initial run-in period not exceeding 3 months.

Oil level indicators shall be fitted for visual checking. Drain cocks, including 316 SS fittings where necessary to permit convenient draining, and plugged at the end, shall be provided for oil reservoirs exceeding 1,5 litre capacity. Drains shall be from the lowest point and syphon type drains are unacceptable.

Lubrication systems shall be designed to exclude dirt and moisture. Air vents on the oil reservoir shall contain an air filter.

SCREW PUMPS

Not

used

CENTRIFUGAL PUMPS

Pump Duty

Details of pump duties are given in the Detailed Specification and the type of pump and materials of construction shall at all times be selected to suit the duty.

Type

Centrifugal pumps shall, wherever feasible, be of the single stage, end suction, back pull-out type, direct coupled to the motor using spacer type couplings and complete with common baseplate

and coupling guard. Close coupled pumps may be used on clear water applications for motor sizes up to 2,2 kW.

Pump Speed

Pump speeds shall not exceed 1 500 rpm.

Pump Motor Speed

Pump motor speeds shall not exceed 1 500 rpm with the following exceptions:

- a) On small (5,5 kW and smaller), high head, low capacity duties, tenderers may submit two-pole speed installations as an alternative offer.
- b) Where the use of speeds above 1 500 rpm avoids the need for of a multi-stage pump, tenderers may submit two-pole speeds as an alternative offer.

Performance Parameters

Performance characteristics shall be suitable for parallel operation with pump head increasing continuously to shut off. The pump shall be selected to operate as close as possible to best efficiency at duty point and shall be adequately sized to safely permit an increase in capacity of at least 25 % should the head be lower than estimated. The impeller diameter fitted to direct coupled pumps fitted shall not exceed 95 % of maximum impeller diameter for the volute/diffuser provided.

Margin of Power

A non-overloading absorbed power characteristic, preferably with maximum power absorbed at best efficiency, is strongly preferred. The motor's continuously rated power shall exceed the greater of the following:

- a) 10 % above the maximum power demand under any condition of operation for the pump, including open discharge.
- b) 20 % above the pump's maximum power demand over the full range of flow and pressure conditions anticipated in the pump installation.

Life

Pumps and motors shall be designed for long life under continuous operation. Bearings shall be designed for an L_{10} life of not less than 50 000 hours.

Lubrication

Unless otherwise specified in the Detailed Specification, bearings shall be grease lubricated and adequately sealed against the ingress of moisture or dirt.

Vibration

Rotating elements shall be balanced and vibration severity of the unit during operation shall not exceed $V_{rms} = 1 \text{ mm/s}$ at the pump and motor bearings.

Pump Glands

Pump glands shall be arranged as follows:

- a) **For clear, non-aggressive liquids up to 200 kPa** discharge pressure - shaft sleeve with packed gland or mechanical seal.
- b) **For clear non-aggressive liquids at pressures above 200 kPa and for clear corrosive liquids at any pressure** - 316 stainless steel shaft sleeve with mechanical seal.
- c) **For liquids with solids in suspension at any pressure** - packed gland with hardened stainless steel shaft sleeve and grease seal. If a mechanical seal is specified, the pump gland shall be arranged to suit a clean water flush. A throttle bushing made of a suitable non-corrosive; self-lubricating material shall restrict the flushing water flow into the pump. Mechanical seals for such applications shall have silicon or tungsten carbide sealing faces.

Venting

A vent cock shall be fitted to the highest part of the casing.

Connections

Suction and discharge connections shall be flanged except on 40 mm connections and smaller which may be screwed. In the latter case, unions shall be incorporated in the pipework close to the suction and discharge connections. As a rule, flexible couplings shall be fitted close to the suction connection of all pumps.

Isolating and Check Valves

Isolating valves shall be provided close to the suction and discharge connections of all pumps. A check valve shall also be fitted between the discharge isolating valve and the pump except where reverse flow through the pump when stationary cannot occur. Valves shall be sized to suit the pipe sizes and not the pump connection sizes. Any reducing necessary shall be done immediately next to pump connections.

Pressure Tapping Points and Gauges

Pressure tapping points shall be provided near the suction and discharge connections of each pump located, wherever possible, on a straight length of pipework where readings will be as steady and accurate as possible. Suction and discharge pressure (or suction, as applicable) gauges shall be fitted at these tapping points.

Strainers

A centrifugal pump which draws from a tank or sump shall be protected by a strainer, suitably designed for the installation. The strainer shall be installed between a shut-off valve and the pump.

SUBMERSIBLE AND IMMERSIBLE PUMPS

General

Details of the duty and performance requirements of submersible and immersible pumps to be supplied are specified in the Detailed Specification.

Submersible sewage pumps shall be provided with a facility to prevent crusts as well as debris and sludge collection on the floor. This shall operate automatically whenever a pump is started.

Submersible Pumps

The motor shall be close-coupled to the pump and separated from the pump casing by an oil chamber. A mechanical seal shall isolate the motor from the chamber and a mechanical seal with tungsten or silicon carbide faces shall seal the oil chamber from the liquid to be pumped. The rated output of the motor shall be 15 % in excess of the maximum power which can be absorbed

by the impeller fitted to the pump at any duty; i.e. the unit shall be non-overloading. Pump speed shall not exceed 1 500 rpm.

The motor shall be shut down automatically in the event of leakage through either seal or because of overheating of stator windings.

Pumps handling raw sewage, primary sludge, activated sludge or similar shall be of a non-chokeable type with open impellers, and shall be capable of handling a solid size of 100 mm diameter or greater. Impellers designed specifically for the application are preferred. These duties must be regarded as abrasive.

Pumps required for abrasive duties shall be designed for low wear. Low operating speeds shall be used. The suction cover shall incorporate a replaceable liner of a suitable abrasion resistant material such as high chrome iron. The design shall permit easy adjustment of the clearance between the impeller and suction cover.

All sewage duties shall be considered to be corrosive.

The shaft, all fasteners and all steel components in contact with the pumped liquid shall be of grade 316 stainless steel or better. The pump and motor casing shall be of high-quality, close-grained cast iron. A suitable, heavy-duty epoxy or polyurethane coating system with a minimum thickness of 400 µm shall protect the pump unit internally and externally.

DRAINAGE PUMPS

General

This Clause applies to drainage pumps to be provided for applications involving seepage, slow leakage, etc. Drainage pumps which are to prevent accidental flooding or other large inflows of water shall be specifically designed for the application by a pump engineer.

Pump

Pumps shall be of the free-standing, submersible sewage, heavy construction, cast-iron type (Zenit Draga or equivalent). Drive motors shall be three-phase units with oil bath and shall have protection to IP 68. The shaft shall be of stainless steel. Switching shall be done in accordance with liquid level by a float switch on cable (rotating arms will not be acceptable).

Installation

Drainage pump installations shall comply with the following:

- a) The discharge pipework shall be rigidly supported at a distance not exceeding 1 000 mm. The discharge point shall be indicated by the Engineer.
- b) The discharge pipework shall incorporate a check valve on the initial upward run of pipework.
- c) The pump's discharge shall be connected to the discharge pipework via a clear flexible hose. It shall be possible to remove the pump and check valve without damaging the pipework.
- d) Discharge pipework shall be of uPVC, Class 12 or higher.
- e) The area of the outlet pipework shall not exceed 200 % of the area of the pump outlet.
- f) Discharge pipework shall be sloped up away from the pump at all points apart from a single final straight run to the drain which may slope downwards at any angle.

POSITIVE DISPLACEMENT PUMPS

Type

"Positive displacement pump" refers to both progressing cavity pumps and peristaltic pumps.

Positive displacement pumps shall be suited to handle the fluids specified.

If the fluid to be pumped is sludge, it shall be noted that this contains solids, fibrous matter and grit. Construction materials shall be selected accordingly and the pump size shall be conservatively selected to ensure a very low operating speed. All universals, pins, bushes and so forth operating in the pumped liquid shall be properly lubricated and must be fully sealed.

Duty

The pump duty will be specified in the Detailed Specification.

Drive Arrangement

Each pump shall be direct coupled to a motor/gearbox unit to suit the range of pump duties. The complete drive unit shall have an ingress protection rating of IP 55 or higher. The pump and drive unit shall be mounted on a common fabricated steel baseplate complete with all necessary guards.

All components shall be conservatively selected to suit the specified type of duty with continuous 24 hour per day operation. The continuously rated output of the motor shall exceed the power required at maximum duty and at the worst operating condition by not less than 30%. The gear unit shall be selected using a service factor of not less than 2, based on the installed motor power.

If applicable, the unit must be prevented from reverse rotation.

Variable Speed Drive

Pumps in variable speed applications shall have their drive motors controlled by electronic variable frequency convertors which are suitably rated for the torque required by the application. The convertor shall be housed in a cubicle in the electrical control panel which is normally in a separate room. The motor and VFC shall be of suitable design and shall be adequately sized to provide the high torque requirements of the pumps under all operating conditions, particularly start up.

Drive Unit Protection

When pumping sludge, it is possible for the pumps to block or seize or have abnormally high starting torque requirements, particularly when operating on a duty/standby rotation basis. The complete installation shall be designed to cope with such operating conditions without damage to equipment.

The drive unit shall be rated to withstand such shock overloads at any torque produced by the motor between full speed and shock stall without any damage. **If any part of the unit could be damaged under such conditions, suitable safeguards shall be incorporated.** Thermal overloads on the motor shall not be regarded as adequate in such a case.

If an overload safeguard system is necessary to protect against overload damage, the system used shall disconnect the load immediately an overload occurs, switch off the unit, activate an alarm indication on the control system and initiate the shutdown of other equipment if this is necessary. A sealed, adjustable, and resettable torque limiting coupling, such as "Bibbigard" or

approved equal, between the pump and drive unit would be acceptable. The coupling must be set for the maximum torque which the drive unit can safely handle.

Full details of the drive system must be provided with the Tender.

Pump Flushing System

A DN 50 connection shall be provided downstream of a check valve on the suction line of all pumps. A DN 50 flushing line from the domestic water supply, or the service effluent water system (if applicable), shall be connected to this. On each branch a solenoid valve, isolating valve, by-pass with isolating valve and check valve shall be fitted. This system shall automatically flush the pump before each start up and shut down. Manual flushing shall also be possible using the by-pass.

Where a system such as that described above is not possible on, for example, a direct feed hopper system, then an alternative flushing system such as a hopper flushing system shall be devised.

Pressure Switches

Where pressure switches are used to protect the pumps against closed or blocked lines by interrupting the supply to the motor, a pressure switch be mounted on the pump outlet and a vacuum switch shall be mounted on the pump inlet.

When used on sewage, sludge, chemical or other applications where blockage or corrosion of the switch is possible, the switches shall be protected by a diaphragm type, liquid filled chemical seal. The portion of the seal in contact with the process liquid shall be suitably corrosion resistant and, when solids are handled, shall have a large threaded socket connection not smaller than 1" BSP.

The switch and its seal shall be mounted on the top leg of a cross with two plugged connections. The cross shall be mounted on the side of the pipe and the bottom and second side connection of the cross shall be plugged, but arranged so that effective cleaning or flushing of connections can be done. An isolating valve shall be provided to permit isolation of the cross from the pipe (see drawing at end).

Pressure Gauges

A suitably rated pressure or combination pressure/suction gauge shall be installed on the suction and discharge of each pump.

General

The following shall be provided for each positive displacement pump:

- a.) A suitable check valve on the discharge pipework.
- b.) Protection against running against a closed discharge, i.e. discharge pressure switch or pressure relief valve.
- c.) Protection against running dry; i.e. suction pressure switch, pump stator temperature switch or low flow signal from related flow meter.

Progressing Cavity Pumps

Progressing cavity pumps shall be installed in compliance with all requirements of this Clause.

The layout of progressing cavity type pumps shall be such that the glands are under the lowest of suction or discharge pressure.

Peristaltic Pumps

Peristaltic pumps shall be installed in compliance with all requirements of this Clause.

Spares

For each progressing cavity pump provided in terms of this Contract, one spare rotor and one spare stator shall be provided as part of the Contract.

For each peristaltic pump installed, one spare hose and ten complete lubricant fills as well as a complete set of tools for replacement of the hose shall be provided as part of the Contract.

METERING PUMPS

Pumps

Metering pumps shall comply with the applicable design and installation requirements for positive displacement pumps but shall, in addition, comply with the following:

- (a) Pumps which feature diaphragms shall be configured or protected so that diaphragm breakage will not lead damage to the internal part of the pump.
- (b) All pump fasteners shall be of stainless steel.

Pump Installation

The following requirements shall be provided for metering pump installations:

- (a) Pumps shall either be mounted on a wall or other rigid vertical mounting surface or shall be mounted on plinths above ground level.
- (b) Pumps shall be provided with an automatic pressure relief system in order to prevent overloading within the pump.
- (c) Pumps shall be provided with check valves downstream of their outlets.
- (d) The pipework on the inlet and outlet of pumps shall be provided with isolating valves and couplers to allow removal of the pumps without dismantling of the surrounding pipework.
- (e) Strainers shall be provided upstream of the pump inlet. The strainers shall be designed and installed in a manner which will allow cleaning of the strainer element without uncontrolled spillage. Strainers shall be provided with inlet and outlet isolating valves.
- (f) A facility for connection of a flushing water pipe shall be provided. Permanently connected flushing water systems shall be provided where specifically called for.
- (g) The piping in the vicinity of a metering pump shall be provided with a drain facility which shall be designed to minimise the amount of dosing fluid which would be lost during removal of the pump from the pipework.
- (h) All mounting fasteners and mounting brackets shall be of grade 316 stainless steel.

PUMP SUCTION STRAINERS

General

Where specified, strainers shall be installed on the suction side of centrifugal and positive displacement pumps which draw from an open tank, channel, sump, reservoir, etc.

Type, Design and Arrangement

Strainers shall preferably be of a proprietary type, A.R.I Semi Globe Filter, Krombach y-type,

or equivalent and shall be of the double-flanged configuration. The basket type of strainer element is preferred in order to facilitate removal of captured solids.

The strainer element opening diameter shall be decided in conjunction with the Engineer.

Suitably rated pressure gauges or combination pressure/negative pressure gauges shall be installed on both the inlet and outlet branch.

Strainers whose baskets exceed 25 litres in volume shall incorporate:

- a.) top pull-out configuration.
- b.) a lifting device, such as a lifting beam with hoist or a davit arrangement, and the strainer basket shall be provided with a suitable lifting eye.
- c.) a hot-dip galvanized steel support or concrete support plinth.

The ratio of open area in the basket to inlet pipe area for non-proprietary units shall be designed to suit the application but shall exceed 7. Baskets shall be made of stainless-steel perforated plate with an opening size to be decided in conjunction with the Engineer. If the Engineer approves the use of wire grid for baskets, the wire shall be of at least 2 mm diameter and shall be of stainless steel. Baskets shall be robustly constructed, shall be provided with adequate flow passages between the strainer element and body and shall withstand the differential pressure developed when a basket is partially blocked. Flat surfaces shall be adequately braced to prevent sag. Lids shall be located at the top of strainer housings, shall incorporate an O-ring type seal and shall be secured with grade 316 stainless steel fasteners. Handles shall be provided on baskets of 25 litres or smaller.

Corrosion Protection

Strainer housings and lids shall be either:

- coated cast iron.
- 316 stainless steel.
- glass reinforced plastic.
- plastic; or,
- Hot-dip galvanized carbon steel.

Coated carbon steel shall only be acceptable if the design is such that internal scraping of the surface is unlikely to occur. In such cases, System A/1 or System A/4 or System "Fusion Bonded Epoxy" will be acceptable.

Testing

Strainer bodies shall be pressure tested to a minimum of 500 kPa and vacuum tested to 70 kPa before delivery to Site.

VERTICAL SHAFT MIXERS

Mixing Performance Tests

The Contractor will be required to test the performance of the mixers when commissioning the plant. This test shall consist of taking a minimum of six samples at random points close to the surface and from the bottom of the compartment within five minutes. Duplicate analysis of these samples for suspended solids concentration will then be carried out in a suitable laboratory and the average concentration calculated. The suspended solids concentration of any one sample shall not differ from this average by more than 200 mg/l.

If the equipment fails to pass this performance test, a second test may be carried out. If the mixers still fail the test, the Contractor shall increase the mixing capacity of the equipment and shall achieve compliance with the performance requirements at no additional cost to Council.

SUBMERSIBLE MIXERS

Details of the mixer application and performance requirements will be given in the Detailed Specification. In general, the mixers are required to thoroughly mix the contents of the tank or chamber, to keep solids in suspension throughout the volume and to prevent a crust forming on the surface.

The mixers shall be submersible with a propeller integrally mounted on a submersible motor. The motor shall be separated from the propeller by an oil chamber. A suitable seal shall isolate the motor from the oil chamber and a mechanical seal with tungsten carbide faces shall seal the oil chamber from the mixed liquid. If the mixer incorporates a gearbox an additional seal shall be provided to isolate the gearbox oil system.

The mixers shall automatically shut off in the event of water contamination of the oil, loss of oil, excessive stator temperature, earth leakage or motor overload and suitable probes and switches shall be provided.

Each mixer shall be provided with one flexible cable to accommodate all the required connections within the machine. Cable lengths shall suit site requirements but a minimum length of 7 metres shall be allowed for.

Propellers shall be of a type suitable for handling stringy solids and thick sludges and shall preferably not require a shroud. The motor shall be of adequate size to perform the required duty with sewage sludges having a dry solids content of over 6% by weight.

The mixer shall be of rugged cast iron construction coated with a heavy-duty epoxy corrosion protection system at least 400 µm thick. If a shroud is necessary, this shall be ruggedly and rigidly fixed with the shroud and all brackets made of a non-corrosive material.

Each mixer shall be mounted with a sliding bracket on a guide column which is located on the floor of the tank and fixed at the top of the tank with a suitable bearing or turntable. It shall be possible to rotate the mixer through an angle of 180° while the mixer is operating and to fix the direction and height in the position selected. The guide column shall extend above the walkway level, as required to suit the specified lifting arrangements.

The operating cross bars or handles, the locking arrangement and the fixing arrangement shall not intrude into any walkway and shall not present a hazard in any way. If necessary, operating levers shall be easily removable.

Tenderer's shall advise whether they consider it to be advisable to allow for variation in mixer inclination in the vertical plane and shall design accordingly.

Suitable lifting arrangements shall be provided for removing each mixer. The general design of the sliding bracket and lifting arrangement shall allow one man to lift the mixer without any jamming, wedging or sticking.

Each lifting arrangement shall incorporate a davit and winch generally complying with the General Specification except that the guide column and turntable may form part of the arrangement. The height of the davit shall be such as to permit the mixer to be swung over the handrails along the walkway. Should the Tenderer consider that the guide column height will be too high with the above arrangement, and then an alternative system with gates in the handrailing at each mixer will be considered. Removable handrail sections shall not be proposed as an alternative.

The guide columns and the entire mounting arrangement and lifting device shall be adequately supported and sufficiently rigid to prevent vibration or noisy operation.

Guide columns, support brackets, etc., shall be of hot-dip galvanized carbon steel (and painted as specified) or of 316L stainless steel. All fasteners, guide pins, turntables, bearings, fixing pins, chains, pivot pins, etc., shall be of 316L stainless steel or, where applicable on items such as bushes, of non-corrosive materials.

Where the mixers are required to operate in sumps or other containers in which the level varies, the mixers shall be designed and arranged to permit the lowest possible operating level and

Tenderers shall state the minimum submergence required. Level controls shall be provided to stop the mixer at the lowest level and restart again at a suitable higher level (except as otherwise specified in the Detailed Specification).

SCREW CONVEYORS

Screw Conveyors - General

Details of the duty, performance and any other special requirements for screw conveyors to be supplied will be given in the detailed specification. Conveyors shall comply with the following:

- a) The conveyor shall be conservatively sized and shall be suitable for handling at least 35 % in excess of the maximum duty specified in the detailed specification. The conveyor shall also be designed to operate well within the maximum design limits for the type of duty specified.
- b) A receiving conveyor shall operate at a capacity of at least 5 % above that of its supply conveyor.
- c) All units must be suitable for operating at any duty between no load and full load, either wet or dry, 24 hours per day.
- d) The conveyor shall be of rigid construction and shall be designed for a life before major repair of not less than 10 000 hours. Each unit shall operate quietly and without spillage or leakage. Protection shall be provided against damage from blockage or jamming.
- e) All radial and thrust loads shall be taken by the screw bearing and shall not be transmitted to the driver.
- f) All greasing points shall be piped to a convenient accessible position, but the system shall provide positive lubrication of each point; i.e. lines shall not be manifolded.
- g) The conveyor shall be driven by direct coupled motor and gearbox. Couplings shall be "Fenaflex", or approved equal, tyre-type couplings with taperlock bushes keyed to the shaft. Guards shall totally enclose the drive.
- h) Conveyors shall be designed for resistance to corrosion. All fabrications such as screws with centre tubes, troughs and covers, supports, guards, etc., shall be manufactured of coated 3CR12, coated 304L stainless steel or of 316L stainless steel. All shafts, pins, fasteners, hangers, sleeves, bushes, rollers, gland followers and other small items shall be made of grade 316 stainless steel or of another non-corrosive material.
- i) On proprietary items such as motors, gearboxes, couplings, sprockets, etc., particular care shall be taken to apply suitable protective coatings. Welding shall be continuous all round to prevent any crevices and all bolted and other mating faces and mounting pads shall be sealed during assembly with a suitable non-hardening sealer.
- j) Trough covers shall be light and easily removable but rigid and strong and shall be of a non-corrosive, UV-resistant material. Covers shall be hinged for inspection purposes and to serve as a relief in the event of blockage in the following positions:
 - at the discharge point and in line with the screw axis. a
 - near the inlet. n
- k) Fixing, supporting and structural arrangements shall consider the very high prevailing winds.
- l) Special care shall be taken to prevent sharp edges on items fabricated from thin sheets. Such sharp edges shall preferably be eliminated by design.

Shafted Conveyors

Shafted screw conveyors shall, additionally, comply with the following:

- a) The conveyor screw shall be kept clear of the trough and shall be supported at both ends by rolling element bearings. These bearings shall be totally enclosed in coated cast iron or stainless-steel housings which shall be adequately sealed against the ingress of moisture and dirt and shall be mounted external to the trough.
- b) With inclined conveyors, the upper bearing shall be the thrust bearing and the bottom bearing shall be mounted clear of the trough and cover. In this case the shaft through the bottom cover shall be sealed by means of a gland incorporating at least one throttle bush, a lantern ring, at least three rings of packing, a positively driven, "Stellited", 316 stainless steel, slip fit shaft sleeve with o-ring seal and 316 stainless steel gland follower. The gland shall be grease sealed or water flushed depending on the application.
- c) The centre tube shall preferably be rigid enough to avoid the use of intermediate bearings. Where the use of intermediate bearings cannot be avoided, they shall be supported by suitable slim hangers which will not interfere with the flow of the product being conveyed. The screw shall also be sized so that the bearing is not immersed in the product being conveyed. The bearings shall be very well sealed, and grease lubricated.
- d) Provision shall be made in the conveyor design for easy replacement of items such as end bearings, intermediate bearings, throttle bushes, shaft sleeves, coupling tyres, chains, etc., without excessive disassembly and without removal of the complete unit. The general arrangement shall permit convenient access to all parts of the unit and shall permit easy installation or removal.
- e) Where appropriate, the screw conveyor shall be designed for abrasion resistance. All applications handling grit or sludge shall be regarded as highly abrasive. The conveyor shall be designed for slow speed and very low rubbing velocities. Outer edges of the conveyor screws shall be manufactured of, or lined with, an abrasion and corrosion resisting material. The trough shall be completely lined using conveniently replaceable 1 000 mm long sections made of a corrosion and abrasion resistant material. Alternatively, the trough shall be lined to a minimum thickness of 6 mm with a suitable repairable material such as neoprene, polyurethane, ceramic lining compound, etc. Full details of the manufacturer's proposals shall be provided with the Tender.

The helical shall be fabricated from material with a thickness of not less than 6 mm.

Centreless Conveyors

Centreless screw conveyors shall, additionally, comply with the following:

- a) The material thickness of the helical outer surface shall be at least 20 mm.
- b) The liner on which the spiral rests shall consist of a polymer featuring a two-colour laminate designed to act as a wear check. Thickness of the liner shall be at least 10 mm.
- c) The complete body shall be of grade 316 stainless steel.
- d) The drive motor shall preferably be mounted at the high point of the conveyor.

INSTRUMENTATION

Calibration of each instrument shall be done to the approval of the Engineer.

Instruments and their cabling shall be protected so that electromagnetic interference does not affect their operation and signal transmission.

Environmental protection shall be as follows:

- (a) Instrumentation, including associated displays and transmitters, located either outside and above ground level or inside shall have IP 55 or higher rating.
- (b) Instrumentation, including associated displays and transmitters, located in underground chambers shall have IP 68 environmental protection and shall be mounted in an enclosure.
- (c) Outside mounted instruments (in cases in which the mounting arrangement allows), and their displays and transmitters shall be mounted in enclosures. Enclosures shall be of polycarbonate construction with transparent front, Fibox EK or equivalent. The complete enclosure installation shall have an IP 55 rating or higher. The enclosure size shall be chosen to provide a clearance of 100 mm all-round the instrument.

MAGNETIC FLOW METERS

Meters

Magnetic flow meter sensors shall be full-bore, in-line, double-flanged units with remotely mounted transmitters. The transmitters shall provide local flow indication and 4-20 mA output. Sensors shall, unless otherwise specified, have IP 68 protection and transmitters shall have IP 67 protection.

Magnetic flow meters shall have polyurethane lined stainless steel tubes with either Titanium or Hastelloy C electrodes. Accuracy shall be $\pm 1\%$ of flow or better. Rubber linings are acceptable for treated water applications.

Calibration shall be in litres per second unless otherwise specified.

For applications other than for treated water, flow meters shall be provided with an electronically operated electrode cleaning device. Automatic, timed cleaning shall be provided.

Installation

The equipment shall be correctly installed, connected, adjusted and calibrated by competent persons. Calibration shall be done in the presence of the Engineer. The operation and signal transmission of meters against electromagnetic interference shall be provided.

The meter shall be installed with a straight pipe length of at least 10 pipe diameters upstream of the sensor and a straight pipe length of at least 5 pipe diameters downstream of the meter. If this is not possible, specific measures shall be taken to provide flow straightening. The complete meter installation shall comply with the manufacturer's instructions.

Grounding rings shall be supplied and installed if the application requires these.

Testing

A factory test calibration certificate shall be provided for each flow meter.

The flow meter shall be provided with a simulation test unit for field verification of the measuring system without removal of the sensor. If more than one identical model flow meter is installed, two simulation test units shall be provided.

GAUGES

Gauges – General

- a) Gauges shall be of durable, industrial construction. Case and bezel shall be of stainless steel unless this material is unsuitable.
- b) Scale markings shall be radial, plain, straight, black lines on a white background and shall be spaced so that one scale division represents approximately 1% - 1,5% of the maximum scale value in values of 1, 2 or 5 multiplied by any power of 10 to suit the maximum operating rating.
- c) On circular gauges the scale shall be concentric and the maximum and minimum scale values shall be near the bottom of the gauge, with the scale symmetrically disposed about the vertical centre line of the gauge.
- d) The tip of the pointer shall be of the knife edge type extending across the scale divisions and shall be as close as practical to the dial.
- e) Wherever applicable, **gauges shall be clearly, strip marked in green to indicate the normal operating range and in red to indicate the non-permissible range of values.** Such markings shall always be on the inner scale face and not on the glass face.
- f) The units of measurement shall be clearly marked on the dial. A printed label of approved non-corrosive material indicating the duty of the gauge shall be neatly fixed on or near the gauge.

Gauge Installation and Mounting

Gauges shall be installed and mounted in accordance with the following:

- a) Gauges shall be mounted vertically and in such a position that they can be easily read from floor level. If this cannot be done, the Engineer's requirements shall be ascertained.
- b) Nozzles shall be provided for gauge tappings. Nozzles shall comply with the requirements of the Clause "Pipework".
- c) Gauges for rotational equipment, such as for centrifugal and reciprocating pumps, shall not be mounted directly on pipework but shall be mounted on walls or on pedestal stands mounted so as to avoid vibration. Gauge cocks shall be provided at each end of the connecting pipework.
- d) Pressure gauges shall be fitted with an isolating and air bleed cock of the type which has handle in line with the bore of the cock when the cock is open.
- e) Pressure gauges used on sewage, sludge, powder, chemical or other applications where blockage or corrosion of the gauge is possible, shall be fitted with a diaphragm type chemical seal, both being liquid filled. The portion of the seal in contact with the process liquid shall be of a suitable non-corroding material and, when solids are handled, shall have a large threaded socket connection not smaller than 1" BSP. With liquids containing solids, the gauge and seal shall be mounted on top of a side-mounted cross having one horizontal and one vertical connection plugged, so arranged to permit cleaning (see drawing).

Pressure Gauges

Pressure gauges shall comply with the following:

- a) Pressure, vacuum or compound gauges shall comply with SABS 1062. Gauges shall be of Accuracy class 1.6 and Durability grade A unless otherwise specified. The gauges shall bear the SABS standardisation mark.
- b) Gauges shall have a scale diameter of not less than 100 mm.
- c) Calibration shall be in kiloPascals with the full scale reading between 1,5 and 2 times maximum actual operating pressure except where otherwise specified.
- d) All gauges shall be suitable for continuous operation and shall be liquid filled on all pump applications and where fluctuations in pressure may cause damage.
- e) Gauges shall not be mounted directly on equipment subject to vibration.
- f) For dry locations indoors, the casing may be reinforced plastic or epoxy coated aluminium and the elastic element and shank of stainless steel. For damp indoor locations, particularly in

- any location where sewage is flowing, and for all locations outdoors, the gauges shall be weatherproof and have the cases and other metal components of grade 316 stainless steel.
- g) When used on steam lines a siphon shall be fitted between the steam line and the gauge which shall be filled with water before putting the gauge into service.

Temperature Gauges

Temperature gauges shall comply with the following:

- (a) Temperature gauges shall have dials not less than 120 mm diameter. Accuracy shall be $\pm 1\%$ of reading or better.
- (b) The gauges shall be fitted vertically into removable 316 stainless steel wells and the gauges shall be removable without leakage from the pipe or vessel. Protrusion into a pipeline shall be kept to a minimum. When handling sludge, sewage or other abrasive liquids the protrusion shall not exceed 15 mm and in this case the wells shall also be of a heavy duty abrasion resistant type.

CHLORINATION SYSTEMS

The design of plant installations for chlorination shall suit the application concerned but shall comply, as a minimum, with SABS 0298.

CONTROL SYSTEMS

General

General requirements for all control systems are as follows:

- (a) All control systems, instrumentation, indication, actuation and other equipment which is necessary to provide an efficient, safe, reliable and easy to operate system in accordance with the requirements of the detailed specifications shall be provided.
- (b) Control shall function as an integrated, coherent system.
- (c) Protection systems with interlocks to prevent maloperation, including incorrect sequencing, and to prevent or limit damage to equipment resulting from operating conditions or equipment failure shall be provided.
- (d) Emergency stop stations shall be provided next to each motor driven unit.
- (e) The failure to start, tripping or stopping of any item of equipment shall prevent the start-up or shall initiate the appropriate shut-down procedure of related equipment as and when necessary.
- (f) Full details for control systems, sequences, logic charts, protections, control panel layout and design, etc., shall be submitted to the Engineer for approval before manufacture. These shall include drawings and circuit diagrams.
- (g) Indication of measured parameters on digital indicators shall be given to three significant places (or more, but not fewer than three).

SCADA SYSTEMS

Control systems which utilise computer-based SCADA shall incorporate the following:

- (a) The control system shall be configured so that the equipment is PLC controlled to the extent that the installation can operate under SCADA failure.

- (b) Functions and information relating to a single item of equipment shall normally be provided on the control panel, MCC or other electrical panel. Functions and information relating to overall control shall normally be provided on the SCADA system.
- (c) Mimic screens provided for SCADA systems shall, where applicable, include at least the following:
 - Overview of scheme; including the process flow diagram and indicating all electronically monitored parameters if these are not included in a sub-system.
 - Overview of each separate installation.
 - Individual unit (Centrifuge, compressor, pump-set, etc.).
 - Equipment sequence selection.
 - Equipment start interlocks.
 - For each motor larger than 55 kW, motor status and, where applicable, motor protection relay diagnostic.
 - Electrical reticulation schematic.
 - Hardware diagnostic.
 - Alarms.
 - Set-points for alarm, trip and control loop functions (including password protected alteration facility).
 - Record of equipment and process parameters at instant of equipment trip and station trip.
 - Trending of all monitored system parameters, with separate screens for logical groupings from an operating point of view.
 - Communication status of control system hardware.
 - SCADA security system password current settings, including personnel names.
 - Ancillary equipment status; e.g. security, fire detection, UPS).
 - Printing.
- (d) Indication of measured parameters shall be provided to three significant places or more.
- (e) All setpoints, such as temperature trip settings, flow trip settings, level settings for pump switch-on, etc., shall be indicated on mimic screens. It shall be possible, with password protection, to alter the set-points.
- (f) All points of inflection of measured parameters shall be recorded.
- (g) At least one colour printer (for graphs, mimics, etc.) and one line printer (for alarms) shall be provided.
- (h) An alarm condition which leads to the control system executing an equipment trip shall be logged and all subsequent alarms which occur as a result of the tripping action shall be logged as subordinate alarms. The condition which caused the trip shall be fully described with respect to the:
 - Item of equipment.
 - Trip setpoint reached.
 - Description of parameter, i.e. flow, temperature, etc.
 - Time.
- (i) Alarm conditions which lead to the control system executing an equipment trip shall be provided with a suitable time delay to limit the number of tripping actions caused by electrical disturbances or similar occurrences. The time delay for each trip shall be decided in conjunction with the Engineer.

CONTRACTOR'S DRAWINGS

The following requirements apply to the preparation of the drawings:

- (a) Drawings shall be prepared in accordance with the latest issue of SABS 0111 (or superseding document). The equivalent BS code of engineering drawing practice will also be acceptable.
- (b) Drawings shall be to A1 size.
- (c) Drawings shall be to scale, with both the scale and the drawing being large enough to clearly show all relevant components of the plant and equipment without misunderstanding.
- (d) Drawings shall be in black ink.
- (e) In addition to the usual plan and two side elevations, sufficient additional sections shall be included to clearly show the arrangement of all plant and equipment.
- (f) General arrangement and detail drawings shall be cross-referenced.
- (g) Items and components shall be systematically and clearly numbered, with consistency (same item numbers) between layout and detail drawings for the same plant or equipment.
- (h) Item lists shall be provided on the drawing or on a separate parts list.
- (i) Item descriptions shall include the material of construction, quantity and full identification information, including, as applicable, brand name, manufacturers reference number, model number, size, rating, source, duty, quantity, etc.

The Contractor shall prepare and correct drawings to satisfy the requirements of the Conditions of Contract and of this Specification to the satisfaction of the Engineer and shall incorporate reasonable changes required by the Engineer.

TUITION

General

The Tenderer shall price for tuition of operational and technical staff. Unless otherwise called for in the Detailed Specification, the Tenderer shall price for the on Site personal tuition of operational staff members and engineering staff members.

The Contractor shall also provide all WMA staff involved with printed copies of the tuition material. Printed copies shall preferably also be included in the Manual.

Operational Staff Tuition

The Contractor shall provide the following tuition as applicable to the Contract:

- a) Start-up, shut-down and operating instruction for all operational modes for the Works shall be provided. This shall be comprehensive and shall include actions to be taken in the case of all alarm conditions and basic fault finding.
- b) A layout drawing of the installation, a process flow diagram, and a P&ID shall be provided for each Operator. The instructions described in (a) above shall also be provided in printed form for each Operator.
- c) If the specified control system is SCADA based, the tuition shall include instruction on the SCADA system.

Electrical Engineering Staff Tuition

The Contractor shall provide the following tuition as applicable to the Contract:

- a) Control system software instruction.

- b) Detailed overview of 11 kV protection and settings.
- c) Tuition on setting of 11 kV protections.
- d) Motor protection relay and settings.
- e) Overview of PLC programming for the purposes of making changes and re-loading programs if PLCs are replaced.
- f) Overview of SCADA system.

OPERATING INSTRUCTIONS

Wall mounted operating instructions, if specified in the Detailed Specification, shall comply with the following:

- a) Start-up, shut-down and Operating instructions shall be provided. These shall be comprehensive and shall indicate actions to be taken in the case of all alarm conditions. These shall be written from the point of view of the plant operator.
- b) A layout drawing of the equipment installation, a process flow diagram, and a P&ID shall be provided.
- c) Instructions shall be framed (wooden frame, glass front, hardboard backing) and shall be attached to the wall in the control room using brass screws.

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

Miscellaneous

The Manual shall comply with the following:

- a) A Manual for the complete Works is required.
- b) Two copies of the Manual shall be provided prior to commissioning of the Works. One copy is to be submitted for acceptance by the Engineer and will be returned to the Contractor. The second copy will be used by the operational staff on Site during commissioning. Unless otherwise specified, six copies of the final version of the Manual shall be provided prior to the end of the Trial Operation Period.
- c) The Manual shall be of a standard acceptable to the Engineer. At least one set shall contain original copies and this set shall be marked "Original". The other sets shall be marked "Copies 2 to 6".
- d) Binders shall have hard, plastic protected covers utilising four-ring, spring-clip holders. Sufficient binders shall be used to make each volume easy to use. One spare, empty binder shall be provided for every three used. A title label shall be affixed to the spine of all binders. This shall indicate contract number, title and location, Contractor's name and, where required, plant description, volume number and contents.
- e) Labelled separator sheets shall be provided between each section and sub-section and also wherever volume or complexity make this advisable.
- f) The Manual shall be in English, shall be easy to use, practically and neatly presented, clearly sectionalised and titled, provided with a Contents List and shall be specifically applicable to the system as installed.
- g) Where standard equipment manuals are used in any sections, these shall be marked up to be unambiguously applicable to the equipment installed and marking up shall be done in a manner which will be transmitted to photocopies.
- h) All sections and sub-sections shall be numbered. Numbering of the Contents List shall be sequenced so that section numbering is unique.
- i) Drawings shall be to a scale which makes all details clear. Large drawings shall be held in plastic envelopes in the Manual. A4 and A3 drawings shall be bound directly. Drawings shall also be provided on CD in AutoCAD format.
- j) Where practical, each section shall form a separate volume.

The Manual shall be divided into sections and shall include the information described below.

Section 1 – General

The following shall be provided:

a) Contents List for the complete Manual. This shall consist of:

- an overall contents list.
- a detailed contents list in front of each section and/or sub-section.
- a comprehensive list of all drawings.

The Contents Lists shall be structured so as not to be affected if volumes are added or subtracted from the Manual.

b) Equipment List for all individual items of mechanical, electrical, instrumentation and control equipment. The Equipment List shall include the make, model, serial number, description, size, range, performance data, motor and drive details, supplier's name, address and phone numbers, all as applicable. The design duty, the position of each unit's installation and its purpose in the system shall be given. Additional information which shall be provided for instruments includes the tag number and setpoints. A schedule of corrosion protection systems used shall be provided for fabrications such as tanks, supporting structures, clarifier bridges, etc.

c) Cable schedule for power and instrumentation cables. This shall include the cable construction, conductor material, insulation, protection, voltage rating, start and finish points, route length, duty, load, voltage drop, no. of cores, core area, no. of cores used and gland size. For cable voltages above 400 Volts, the schedule shall also include the purchase details, specification, and date of manufacture.

d) Cable routes.

e) Drawing list of all Contractor's and Tender drawings.

f) The detailed specification, Section D of the Specification, may be included in this section.

Section 2 – Process, Operation and Control

The following shall be provided:

a) Description of plant and process design and including all design parameters.

b) A description of each system supported by drawings, process flow or circuit diagrams and explanatory sketches to assist operating staff.

c) Description of control system, including control panels and SCADA system, as applicable and including controls, instruments, settings, indications, alarms, trips, etc. Functional Specification. List of protections, including description, sensor, operating limits, settings, etc.

d) Straight forward, step by step, initial start-up instructions for commissioning. These shall include operating steps, precautions, settings, adjustments, observations, etc.

e) Training manual including normal start up, adjustment, operating and shut down procedures for the system as installed and including settings, adjustments, observations, etc. The procedures shall highlight any safety precautions to be observed.

f) Functional description and operation instructions of all electrical panels.

g) An Instrument List giving a description of the duty as well as the serial number, normal operating reading, maximum or minimum permissible readings, set-points (activation, warning and trip), etc.

h) Trouble-shooting guide, including symptoms, causes and solutions.

- i) Documents:
- ✦ as-built system, layout and GA drawings.
 - ✦ plant circuit or flow diagrams
 - ✦ P&IDs, indicating equipment, piping, valves, instrumentation and safety devices.
 - ✦ control panel layouts.
 - ✦ I/O list, program listing, loop and logic diagrams for each PLC, if applicable.
 - ✦ paper copies of SCADA mimics, if applicable.
 - ✦ system control diagram and logic sequence chart, as applicable.

Section 3 - Maintenance Schedules

The following shall be provided for all mechanical, electrical, instrumentation and control equipment:

- (a) A comprehensive lubrication schedule of recommended and initial lubricants, capacity, lubrication periods, etc., for all items.
- (b) A comprehensive maintenance schedule of routine maintenance by time period for the new installation and including information for individual items.
- (c) It is not required that the detail information in supplier's standard manuals is repeated here and cross-references will be acceptable on condition that the position of the supplier's manual in the contents list is given.

Section 4 - Mechanical Equipment

The following shall be provided for each item of mechanical equipment:

- (a) A copy of the information applicable to the item and appearing in the Equipment List.
- (b) A separate table containing the unit's nameplate information; or, a photograph of the nameplate.
- (c) Technical and descriptive literature, including principle of operation and construction.
- (d) Installation instructions.
- (e) Detailed operating instructions.
- (f) Control and electrical details, including logic sequence, circuit diagrams and software, as applicable.
- (g) Full technical and maintenance information including instructions for assembly, disassembly, lubrication, adjustment, calibration, reconditioning, repair, etc.
- (h) A spares list giving the item number, part number, description, quantity and materials. A list of recommended spares.
- (i) Factory and Site test results.
- (j) Corrosion protection systems used, coating supplier's data sheets and coating repair procedures.
- (k) Drawings:
 - performance curves.
 - layout drawings.
 - large scale, dimensioned, cross sectional and arrangement drawings of the item for assembly and spares recognition purposes, cross-referenced to the spares list.
 - dimensioned drawings of fabricated equipment.

▪circuit layout of any auxiliary systems.

Section 5 - Electrical Equipment

The following shall be provided for each item of electrical equipment:

- (a) A copy of the information applicable to the item and appearing in the Equipment List.
- (b) A separate table containing the unit's nameplate information; or, a photograph of the nameplate.
- (c) Technical and descriptive literature, including principle of operation and construction.
- (d) Control and electrical details, including logic sequence, circuit diagrams and software, as applicable.
- (e) Installation instructions.
- (f) Detailed operating instructions.
- (g) Full technical and maintenance information including instructions for assembly, disassembly, lubrication, adjustment, calibration, reconditioning, repair, etc.
- (h) A spares list giving the item number, part number, description, quantity and materials. A list of recommended spares.
- (i) Factory and Site test results.
- (j) Drawings:
 - electrical reticulation.
 - equipment overall dimensions.
 - wiring diagrams.
 - switchboard layout drawings and SLDs.
 - electrical panel construction drawings.

Section 6 - Instrumentation Equipment

The following information shall be provided for each item of instrumentation equipment:

- (a) A copy of the information applicable to the item and appearing in the Equipment List.
- (b) A copy of the relevant information in the table of instrumentation in the sub-clause "Operation Section" and including all settings.
- (c) Installation instructions.
- (d) Descriptive and technical literature giving full details of performance, operation, calibration, setting, service, maintenance and spares including suitable assembly drawings.
- (e) Technical and descriptive literature, including principle of operation and construction.
- (f) Control and electrical details, including logic sequence, circuit diagrams and software, as applicable.
- (g) Factory test results.
- (h) Full technical and maintenance information including instructions for assembly, disassembly, lubrication, adjustment, calibration, reconditioning, repair, etc.
- (i) Drawings:
 - ⊕ circuit diagrams of both instrumentation systems and individual instruments.
 - ⊕ overall dimension and installation drawings.

Section 7 - Control Equipment, Network and Software

The following shall be provided, as applicable to the Works:

- (a) A copy of the information applicable to PLCs, transmitters, HMIs, computers, etc. which appear in the Equipment List.
- (b) Cross-referenced listing of all I/O used.
- (c) Prints of SCADA mimic screens (all copies to be provided in colour).
- (d) An annotated program listing.

- (e) Drawings:
- ✦ copy of hardware diagnostic mimic.
 - ✦ loop drawings showing field terminal numbers, marshalling terminal numbers and PLC rack/slot/terminal numbers.

Section 8 – Drawings

All drawings not filed elsewhere shall be filed in this section.

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

The contents of the Manual shall be generally as follows:

- 1** GENERAL
 - 1.1** Contents List
 - 1.2** Overall Description of Works
 - 1.3** Equipment List
 - 1.4** Drawing List
 - 1.5** Cable Schedule
- 2** PROCESS, OPERATION AND CONTROL
 - 2.1** Description of Plant and Process
 - 2.2** Control System
 - 2.3** Protection System
 - 2.4** Commissioning
 - 2.5** Normal Operation
 - 2.6** Instrument List
 - 2.7** Troubleshooting
- 3** MAINTENANCE SCHEDULES
 - 3.1** Lubrication Schedule
 - 3.2** Maintenance Schedule
- 4** MECHANICAL EQUIPMENT
 - 4.1** (Item 1; e.g. "Chlorinators")
 - 4.2** (Item 2; e.g. "Pump")
 - 4.3** (etc.)
- 5** ELECTRICAL EQUIPMENT
 - 5.1** (Item 1; e.g. "Transformer")
 - 5.2** (Item 2; e.g. "MV Switchboard")
 - 5.3** (etc.)
- 6** INSTRUMENTATION EQUIPMENT
 - 6.1** (Item 1; e.g. "Turbidimeter")
 - 6.2** (Item 2; e.g. "Pressure Transducer")
 - 6.3** (etc.)
- 7** CONTROL EQUIPMENT, NETWORK AND SOFTWARE
 - 7.1** (Item 1; e.g. "PLC")
 - 7.2** (Item 2; e.g. "SCADA Software")
 - 7.3** (etc.)
- 8** DRAWINGS

This contents list may be elaborated and/or repeated as required.

STARTING, SITE TESTING AND COMMISSIONING OF PLANT

Before starting up any section of the Works, the Contractor shall make all necessary checks to ensure that the installation has been correctly carried out, that all ducts, pipework, tanks, etc., are clean, that all equipment is correctly aligned, lubricated and connected up, and is in all respects ready to start with safety. It shall be noted that all initial fill requirements such as lubricating oil shall be the responsibility and at the cost of the Contractor.

The Contractor shall arrange for the Engineer to be present at initial start up and also, if applicable, for the electrical and control instrumentation sub-contractors to be present.

The Contractor shall start up and test each section of the Works. These tests will be carried out to certify that the Works is operating in accordance with the requirements specified and must be witnessed by the Engineer. All necessary modifications and rectifications shall be carried out during this period.

Three copies of reports in writing on all tests shall be submitted by the Contractor within two weeks after the tests have been carried out.

When all tests have been completed to the satisfaction of the Engineer, the Works shall be commissioned. Unless the Engineer states otherwise, the complete plant, including all control functions and control systems shall be commissioned as a unit and the process performance requirements shall be achieved during normal operation. The Contractor shall train the operational staff in the starting, operating and stopping of the Works, and shall train the maintenance staff on the routine maintenance requirements.

PART B: MECHANICAL

PART B2 - PARTICULAR MECHANICAL SPECIFICATIONS

PSB2.1: General

PSB2.2: Screens

PSB2.3: Mechanical Grit Removal

PSB2.4: Flow Measurement

PSB2.5: Mixers

PSB2.6: Surface Aerators

PSB2.7: Axial Flow Mixed Liquor Recycle Pumps

PSB2.8: Pumps and Associated Pipework and Specials

PSB2.9: Weirs and penstocks

PSB2.12: Lime storage and Dosing Equipment

PSB2.13: Miscellaneous

PSB 2.14: Notification Period

PSB 2.15: Maintenance of Equipment

PSB 2.16: Clarifiers

PART B: MECHANICAL

PSB 2 PARTICULAR MECHANICAL SPECIFICATIONS

PSB2.1 GENERAL

PSB 2.1.1 GENERAL DESCRIPTION OF WORK

This Contract covers the supply, delivery, erection, installation, testing, commissioning, and upholding during the period of Operation Service, of Mechanical equipment only to be incorporated in the refurbishment and upgrading of the 2 ML Lethabong Wastewater Treatment Works by 8ML to a 10ML works.

PSB 2.1.2 DESCRIPTION OF THE SITE AND ACCESS

The site is located on the site of the existing Lethabong Wastewater Treatment Works.

The treatment site is accessible by an existing tar road.

PSB 2.1.3 SCOPE AND SUB-DIVISION OF CONTRACT

This Mechanical part of the Contract has been divided into sections as follows:

PSB 2.1:	General
PSB 2.2:	Screens
PSB 2.3:	Mechanical Grit Removal
PSB 2.4:	Flow Measurement
PSB 2.5:	Mixers
PSB 2.6:	Surface Aerators
PSB 2.7:	Axial Flow Mixed Liquor Recycle Pumps
PSB 2.8:	Pumps and associated Pipework and Specials
PSB 2.9:	Weirs and Penstocks
PSB 2.12:	Lime storage and Dosing Equipment
PSB 2.16:	Clarifiers
PSB 2.17:	Chlorination

The Scope of Works to be carried out under this Mechanical Part of the Contract is the supply, delivery, installation, and commissioning and maintaining during the Defects Liability Period of:

a) Inlet Works

- 1 x Hand raked screen
- 2 x Mechanical front raked screens
- 1 x Screenings washing and screw compactor and conveyor
- 2 x Submersible Grit Pumps and Pipework
- 1 x Grit classifier
- 1 x Ultrasonic flow meter
- 1 x Parshall Flume
- 6 x Penstocks with hand wheel operation
- Overflow Weirs
- 4 x Waste skips with skip trolleys

b) Biological Reactor

- 4 x Mixers
- 5 x Surface Aerators

- 2 x Penstocks
- GRP grating
- 3 x Axial flow a-recycle pumps
- Overflow weirs
- c) Clarifiers
 - 2 x Rotating half bridges with scum collection
- d) RAS Pumps
 - 3 x Axial Flow RAS Pumps
 - 2 x Online magnetic flow meters
- e) WAS pumps
 - 2 x Centrifugal Pumps with associated external steel pipework and valves
 - 1 x Online magnetic flow meter
- f) Submersible Pumps
 - 1 x Submersible dewatering pump with associated pipework
 - 1 x Submersible scum removal pump with associated pipework
- g) Lime Dosage
 - Lime storage
 - 1 x Lime dosage equipment
- h) Laboratory equipment
- i) Chlorination
 - 1 x Chlorine dosage equipment
 - 1 x Scale
 - 1 x Motivation water feed system
 - 1 x Safety equipment

PSB 2.1.4 FACTORIES, MACHINERY AND BUILDING WORKS ACT No. 22 OF 1941 (as amended) AND THE MACHINERY AND OCCUPATIONAL SAFETY ACT No. 6 OF 1983 (Republic of South Africa)

All items supplied and installed under this Contract shall meet the requirements of the above Acts, as amended from time to time, and meet all the requirements of the Government Inspector, and of all Laws, Bye Laws, Regulations, and requirements of Local and other Authorities having jurisdiction over this Contract.

PSB 2.1.5 STANDARD SPECIFICATIONS

Unless otherwise authorized, all plant and equipment and structures shall comply in every respect with the appropriate SANS or BSS Standard Specifications and Codes of Practices where applicable. Under all circumstances the latest edition of, or amendments to, the Standard Specification or Code of Practice shall apply.

PSB 2.1.6 ALTERATIONS, ERASURES OR ADDITIONS

No alterations, erasures, or additions of any kind whatsoever, shall be made by the Contractor, in, from, or to any of this Specification nor to any part of the Supplementary Specifications, Calculations and Schedule of Measurements

Rates and Prices, supplied by the Contractor, and should any such alterations, erasure or addition be made, the same will not be recognized by the Engineer.

PSB 2.1.7 PACKING

All materials shall be properly and securely packed and protected against all risk of damage by handling or corrosive influences on land or sea, and the material shall be delivered and kept on site in a perfect condition and free from damage. The Contractor shall take all risks of damage to plant and materials in transit.

PSB 2.1.8 FINISHED WORK

All plant and equipment shall be carefully fabricated and installed, tested for operation and adjusted so that it functions properly. Any changes or adjustments required to obtain satisfactory operation shall be made by and at the expense of the Contractor. The finished work shall be to the full dimensions expressed or implied by the Contract Documents. Each trade shall do the necessary jobbing after other trades and upon completion shall make good its own particular class of work when this has been in any way affected or impaired by any other work.

PSB 2.1.9 PROVISION FOR COMPLETE PROCESSES AND DESIGN CRITERIA

Tenderers must include in their prices for all plant and equipment necessary for the proper and correct operation of each process. Full details must be given of all ancillary plant and equipment included in the offer such as pumping plant, heating equipment, electrical equipment, controls, recorders, chemical dosing, storage and mixing tanks and similarly necessary equipment.

PSB 2.1.10 COVER UP WORK

The Contractor is to provide for covering up and protecting part or parts of the work where required or as may be directed by the Engineer during wet or inclement weather or from the effects of the sun.

PSB 2.1.11 CLEAN UP AND RESTORE BUILDINGS AND STRUCTURES ON COMPLETION

Buildings, tanks and other civil structures will be handed over to the Contractor in a clean, dry condition, and are to be handed back in a similar condition.

PSB 2.1.12 ERECTION AND CHECKING OF WORKS

As each part of the Contract works is installed and ready for testing, it shall be passed by the Engineer. Such passing shall in no way exonerate the Contractor from any of his guarantees and responsibilities.

PSB 2.1.13 STANDARD OF WORKMANSHIP

The attention of Tenderers is directed to the high standard of workmanship required in the design and installation of the plant to be supplied under this contract. All plant shall be installed accurately in its correct position as shown on the drawings, and fixed, grouted and permanently installed to operate as designed, without failure of the holding fixtures.

All installations shall be neatly finished off so that identical pieces of equipment are the same and any unnecessary damage done to building works shall be repaired at the Contractor's expense.

All bolts, including hold down bolts, shall be to correct length of thread protrude for each set or series of bolts. In any event, the length of thread protruding shall not exceed 5 times the thread pitch.

PSB 2.1.14 INTERFERENCE WITH EXISTING SERVICES

The Contractor shall carry out the contract works with the minimum interference with the existing services. Service pipes and cables, etc., in the vicinity of the new works shall receive special care. The Contractor will be held

responsible for all delays and interference with services and claims arising there from. He shall bear the cost of repairing any damage to the same, due to negligence or miscalculation on his part.

PSB 2.1.15 PROTECTION

The Contractor shall be responsible for and make good all damage to the works and site, from any cause whatsoever, and shall reinstate in all respects at his own expense the works and site up to the date of the final performance of this Contract.

The Contractor shall case up or otherwise protect and cover up all works requiring the same, including the work of sub-contractors, and shall remove same and clean off on completion including soiling and other damage to finishes in building.

The Contractor shall keep the whole of such works throughout the currency of the contract, free and clear of water, sand, silt, mud or any obstruction whatsoever which may arise or come into any part thereof whether by reason of rains, floods, springs, surcharging or temporarily blocked storm water drains, or any other cause, and shall provide for all necessary temporary coverings, drains, piping, channels, permanent or temporary trenches, bailing, pumping and so forth, as may be necessary.

PSB 2.1.16 INSTALLATION AND ERECTION

The installation and erection of all equipment supplied under this contract shall be the responsibility of the Contractor. The cost of establishing on site, required guarantees and lifting equipment shall be covered in the general rates. The Contractor shall be responsible for ensuring that any work carried out by his own staff or any sub-contractors working for him is to his satisfaction and that the equipment will meet all requirements of the Specification as well as in compliance with the provision of the Factories, Machinery and Building Works Act No. 22 of 1941 (as amended) and the machinery and Occupational Safety Act No 6 of 1983 (Republic of South Africa) and all of the statutory regulations applicable to the work envisaged.

The Contractor shall be responsible for proving all bolts, nuts and washers and steel supports such as columns and brackets and fixing them in position and the costs of fixing and providing support must be included in the tender price.

Before erection, the Contractor shall check all levels, dimensions or holes, supports, fixtures, pipes and all other work.

The dimensions of all equipment must be checked by the Contractor after manufacture and on delivery. The plant shall not be erected until the above has been checked by the Contractor.

If the Contractor proceeds with installation of the equipment, it shall be taken that he has checked the critical dimensions and no claims for additional erection costs in respect of faulty dimensions will be admitted after this point.

PSB2.2 MECHANICAL SCREENS

PSB 2.2.1 GENERAL SPECIFICATIONS

Two mechanical fines screens will be required with a bar spacing of 8mm. One screen will always be operational while the other will be a standby. The screens shall also comply with the following requirements:

- a) The screens shall be of the inclined front raked type, installed at an angle of approximately 70° to the horizontal.
- b) The screenings shall collect against taper bar screens and then automatically remove the trapped screenings by means of a continuous moving, multiple rake system.
- c) The screens shall be designed to offer a minimum resistance to the inflow passing through it. The maximum permissible head loss through the system shall be 250mm.
- d) The following specifications shall also apply:

Quantity	2 Fine screens: 1 Operational other a standby
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Spacing between bars	8mm
Channel width	400mm
Maximum flow at full capacity of 10 ML/day	232L/sec
Channel depth	800mm
Maximum water depth	500mm
Gearbox/motor manufacturer	SEW, IP55, 380V
Output speed	8 r/min
Materials of construction	
Side plates	304SS
Cover plates	304SS
Sprockets	304SS
Drive shaft	304SS
Chain links	304SS
Chain rollers	Ertelyte
Gearbox, motor & bearings	Manufacturer's heavy duty coating.
Mechanical overload	To be included

PSB 2.2.2 FRAME

The rectangular frame shall be laser cut for maximum accuracy and is recessed to accommodate the chain guides and idler sprockets and is set in the channel at approximately 70° to the horizontal. The frame may be grouted into position in recesses in the channel walls and invert or braced at coping level on a spindle bar permitting the unit to be swivelled from the channel.

The frame is to be fully welded to the sole plate, the debris plate, and the discharge chute. At the upstream face of the unit, box-section cross-members are securely welded to the side members of the frame at regular intervals thereby forming a rigid frame for the screen cladding.

PSB 2.2.3 TAPERED SCREEN BARS

The tapered screen bars shall be machined from grade 304SS solid stock and accurately set in laser cut slots at the required spacing and solidly secured to the brace-plates for bolting onto the screen frame, for easy removal of the screen field. Intermediate stiffening supports perpendicular to the bars are used to brace the screen bars at the downstream surface of the screen field. These supports are welded to the screen bars for extra support and each screen bar is individually welded to the stiffening support.

Whilst the tapered screen bars are primarily used to prevent blinding of the screen field due to particles being wedged in the screen field, they will also minimise the head losses through the screen field.

PSB 2.2.4 SOLE PLATE

The sole plate shall be curved to induce screenings and debris in the lower level of the flow to be directed onto the lower portion of the screen bars thus preventing accumulation at the foot of the screen. The leading edge of the sole plate to be level with the channel invert.

PSB 2.2.5 RAKING MECHANISM

The raking bars with tines shall be cold formed from a single laser cut plate to ensure complete stiffness across the full width of the bar. When engaged these tines form an angle of 5° to the plane of the screen field.

Each raking bar shall be attached and accurately aligned to the drive chain within the side members of the screen frame utilizing suitably fabricated links. The tines to be set to engage the screen field across the full width.

PSB 2.2.6 CHAINS, GUIDES, AND SPROCKETS

The chains to consist of stainless-steel links that are joined at each ertelyte roller with a stainless-steel pin. Chain guides are fully adjustable and securely fixed to the side members of the screen frame for the full length of travel of the chains.

Idler sprockets or bottom turnovers to be located at the lower end of each side member of the screen frame and are laser cut from 20mm stainless steel plate. Each sprocket also to contain a fully welded bush housing a self-lubricating composite bush.

Sprockets to be retained on their respective stub axles utilising a removable retaining mechanism to facilitate maintenance.

The drive shaft at the head of the screen frame shall be fitted with two chain sprockets that are mounted with keyways onto the shaft.

PSB 2.2.7 DRIVE UNIT

The drive unit shall be selected for continuous operation and consist of a shaft mounted gearbox mounted directly onto the drive shaft to protect the gearbox bearings from undue stresses due to possible misalignment.

The drive bearings to be of the conveyor take-up type to enable the drive chains to be correctly tensioned and the raking bars to be accurately positioned across the screen face. No special tools or disassembly of the unit shall be required for this operation.

PSB 2.2.8 CLEANING MECHANISM

The cleaning mechanism shall comprise of a single bar that engages each raking bar as it rises above the upper edge of the screening retention plate. This discharge scraper engages the full width of the raking bar to ensure effective screenings removal.

PSB 2.2.9 SCREW CONVEYOR

The screenings from both screens shall drop onto a single centreless spiral conveyor which will feed it to a single screenings compactor. The spiral diameter shall be 215mm and the pitch 190mm.

PSB 2.2.10 SCREENINGS COMPACTOR WASHER

The wet screenings from the screen, with a moisture content of 85 to 90%, are fed from the screen into the holding compactor hopper mounted directly over the screw chamber of the press. Capacity is 3.5 m³/h of wet screenings (therefore SAME model CW 350 or similar). A rotating shafted spiral conveyor transports the solids to the compacting zone where they are dewatered and at the same time conveyed to the outlet. The compacting zone shall be equipped with spray nozzles for washing organic material contained in the screenings. The dewatered solids are thereafter conveyed via a screw conveyor to discharge into the designated skip.

Screenings Press	
Quantity	1 of –under both screens
Type	Hard-faced Archimedean screw

Screw diameter	200mm
Installed power	3.0 kW x 4p, 400V x 3ph, IP55
Output speed	9.6r/min
Minimum Service factor on absorbed power	2.5
Materials of construction	304SS

PSB 2.2.11 WASH WATER SUPPLY

Wash water to wash out the solids trapped in the screenings will be provided from a 5000-litre plastic storage tank by means of two (1 operational; other a standby) pumps. The Pressure generated by the pump shall be 5bar and a flow of at least 4L/sec shall be maintained.

PSB 2.3 HAND RAKED SCREENS

One hot dip galvanised hand raked screen in 750mm wide channel, complete with rake are to be provided. Screen bars shall be angled at 45° and shall be made from 19 x 10 mm bars spaced at 40mm centres.

The flows will be Max. storm water: 300 L/sec; Average: 116L/sec.

One 2m long rakes to fit the openings allowed in the screens.

The screens will be fixed to the service platform by two anchor bolts for easy removal. The anchor bolts to be in stainless steel.

The hand rakes shall also be in stainless steel with aluminium handle.

PSB2.3 MECHANICAL GRIT REMOVAL

PSB 2.3.1 DEGRITTER EQUIPMENT

Grit will be lifted by means of a vortex submersible pump from the base of the conical grit collection hopper of the vortex grit trap and pumped via a ND80 galvanised steel pipe to ground level and then horizontally to the grit classifier.

One pump with relevant delivery pipework will be required per grit trap.

The pump requirements shall be a minimum of 10L/sec at a maximum static head of 5m. Its maximum speed shall be 1500rpm with a maximum solids allowance of 65mm.

The recommended pump shall be a Fluid Pump VX65-40-4 (5.5kW;400Volt) or similar approved.

PSB 2.3.2 GRITTER CLASSIFIER

PSB 2.3.3.1 General

The grit mixture is pumped into a receiving hopper which is provided with an inclined grit washing-dewatering screw. Grit is conveyed from the bottom of the hopper by a screw, washing the grit below the water level in the hopper and dewatering the grit efficiently along the remainder of the inclined screw.

The screw deposits the dewatered grit into a skip. The discharge level is about 2,0 m above the ground level. It is essential that the grit and organic matter are separated effectively to ensure minimal contamination of the classified grit. Elimination of organics results in maximum drainage of water to obtain a dry grit.

The grit separator shall consist of a centreless spiral, fitted inside a semi-circular trough which is angled at about 25° and which has a settling chamber fixed to it. The trough is constructed in stainless steel and fitted with protective 3CR12 liner bars as well as the required fixtures for a motor, gearbox, and support legs. The screw shall be driven by a motor-gearbox set located at the top end of the trough. The separator shall have two grit inlet pipes and one water return pipe (ND100). The return water will feed back into the inlet works ahead of the grit chamber.

All pipe work between the vortex de-gritters and the grit classifier and the water return line, shall be galvanized steel.

PSB 2.3.3.2 Drive Unit

The screw drive unit comprises of a hollow shaft helical geared motor that mounts directly on the screw top shaft. It is mounted outside the main housing and prevented from rotating by a torque arm connected to a bracket on the housing. This arrangement prevents overdue stresses on the gearbox due to misalignment and the mechanical power rating of the unit is at least two times the installed power.

The motor shall have a drive capacity of at least 0.25kW.

PSB 2.3.3.3 Materials of Construction

Trough housing:	Approximately 5m x 330mm inside - 304 stainless steel at least 4.5mm thick
Hopper:	304 stainless steel at least 4.5mm thick
Water discharge:	ND100
Helical screw:	Centreless: 290mm dia x 180mm pitch – Carbon steel, primed and epoxy painted
Wear bars:	50 x 10mm - 3CR12
Gearbox and Motor:	Approximately 6rpm - 0.55kW IP55 IE 400V
Support legs:	304 stainless steel
Safety covers:	304 stainless steel – 1.6mm

PSB 2.3.3.4 Bearings

The bottom bearing assembly, being permanently under the liquid level, consists of a sealed bearing of approved design to completely prevent the ingress of dirt and water. The bearing housing is manufactured in grade 304 stainless steel.

PSB 2.3.3.5 Drive assembly

The speed reducer is selected for continuous operation 24 hours per day.

PSB 2.3.3.6 Duty

The grit separator recommended is a SAME: GS200 model or similar approved.

PSB2.4 FLOW MEASUREMENT

PSB 2.4.1 SCOPE

This section of the contract covers the supply, delivery, erection, installation, putting into satisfactory operation, testing and upholding during the Period of Operation Service, of ultrasonic flow measuring equipment as described below as well as a 305mm throat width Parshall flume at the Inlet Works and a magnetic flow meters on each of the two RAS pipelines.

PSB 2.4.2 TYPE OF EQUIPMENT

PSB 2.4.2.1 Ultrasonic Flow Meter

The required equipment is to be installed adjacent to an open channel in which a new measuring flume will be constructed to the design and dimensions in accordance with the requirements of a 305 mm wide throat width Parshall flume.

The maximum flow to be measured will be 300 litre/second but the recording range shall be 0 – 350L/sec.

The transducer will have a programmable range and built-in flow curves. The converter will have a digital display of rate of flow, totalizer, time, and liquid height. It has an isolated 4-20mA output programmable over any range and five built in relays, which can be used for pulsed output, alarms, and other digital switching applications. Power supply is 230Vac.

For data recording purposes a single channel flow data logger for above flow meter including download Microsoft Windows based software and communications cable are required.

Rate of flow shall be indicated and recorded in litres per second and total flow shall be measured in kilolitre. Equipment and recording percentage of design flow, shall not be accepted. Charts supplied with the plant, shall record at least one week's flow per chart.

A battery back-up is required housed in a stainless-steel box, bolted to a wall.

Recording equipment shall be pedestal mounted and be weatherproof or provided in a weatherproof box.

PSB 2.4.2.2 RAS Recycle from each Clarifier to the Biological Reactor

The required magnetic flow meters are to be installed on each of the two ND300 delivery lines from the two Secondary Clarifiers to the Anoxic Reactor. The flow range to be measured by each meter shall be between 50 and 120L/sec. No data recording is required, only instantaneous flow in L/sec. It shall have an isolated 4-20mA output.

PSB 2.4.2.3 WAS Pump Line

The required magnetic flow meter shall be installed on the ND100 delivery line from the WAS Pumps to the Sludge Drying Beds. The flow range to be measured shall be between 10 and 20L/sec minimum. No data recording is required, only instantaneous flow in L/sec. It shall have an isolated 4-20mA output.

PSB 2.4.2.3 Summary

• Flow meter	
Quantity	1 off – Head of Works – Flow measurement 2 off – RAS pump lines
Type	4-20mA Loop powered transmitter and multi-function control unit
Data logger	Commubox Windows O/S compatible c/w software

PSB2.5 MIXERS

PSB 2.5.1 SCOPE

Vertical shaft slow speed platform mounted mixers in the anaerobic and anoxic zones of the Biological Reactor.

PSB 2.5.2 MIXERS SPECIFIED

DESCRIPTION	ANAEROBIC	ANOXIC
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Quantity	2	2
Basin volume: Depth	2330m³: 5.1m	2900m³: 5.1m
Minimum Mixing intensity	6W/m³	6W/m³
Output minimum required each shaft	7kW	10kW
Recommended Output each meter	11kW	11kW
Rotating Speed	25rpm	25rpm
Materials of Construction	Gr300W steel	Gr300W steel
Corrosion Protection	Coal tar epoxy coating DFT>350µm	Coal tar epoxy coating DFT>350µm
Gearbox Designation	Only Siemens, SEW or Bonfig	Only Siemens, SEW or Bonfig
Minimum Service Factor on Installed Power	2	2
Design Bearing Life	>100 000hours	>100 000hours
Motor Speed	1460rpm	1460rpm
Motor Voltage	400V	400V
Noise Level (gearbox & motor only)	<85dBa	<85dBa
Motor	Zest 4P C/W anti-condensation heaters and thermistors	Zest 4P C/W anti-condensation heaters and thermistors
Ant-condensation heater voltage	220V	220V

PSB 2.5.3 QUALITY ASSURANCE

Provide mixers by a company with the minimum of five (5) years' experience in the manufacturing of this type of equipment.

PSB 2.5.4 FUNCTION

- Provide slow speed stirrer to provide gentle mixing without introducing oxygen through surface agitation.
- Design stirrer to induce scour velocities at the tank floor to re-suspend carrier media settled during a power failure.

PSB 2.5.5 CAPACITIES AND PERFORMANCES

- Maximum power absorbed by stirrer not to exceed 85% of installed power.
- Design low shear impellers.

PSB 2.5.6 EQUIPMENT COMPONENTS

PSB 2.5.6.1 Shaft underline

Shaft to withstand required torque and bending loads at all operating conditions. The output shaft of the gearbox through the bearing shall be a minimum of 80mm.

PSB 2.5.6.2 Impellers

Design impellers to induce a low shear vertical radial pumping action.

- Balance impellers statically.
- Design for bladed non-clog impellers.

PSB 2.5.6.3 Speed Reducers for vertical shaft Mixers

The Mixers are to consist of a dual curved-blade, radial-flow impeller mounted on the end of a drive tube and contained in a vortex tube. The impeller, in turn is to be connected to the gearbox/motor unit via a rigid coupling and the entire assembly is fixed to the concrete access bridge. All service-able parts are to be situated above TWL, but the entire unit must be removed through the access bridge.

The rated output power of the motors shall be more than 115% of the maximum power requirement at the mixer shaft.

Design speed reducers for continuous operation 24 hour per day with a mechanical power rating (according to AGMA) equal or greater than twice the installed motor power. Base thermal power ratings on an ambient temperature of 40°C.

Provide gears and pinions thoroughly hardened and ground after machining.

The gearbox shall be fitted with a reinforced output flange housing a heavy duty double spherical roller bearing to accommodate the overhung and axial loads, with all bearings designed for a life of at least 100 000 hours at a B-10 rating. Proof of such rating must accompany the Tender.

Provide bearings on the output shaft capable of withstanding the resultant forces caused by the combination of concurrent radial and axial loads. Select bearings to comply with the following conditions:

$$\frac{\text{Actual partial load}}{\text{Permissible radial load}} + \frac{\text{Actual axial load}}{\text{permissible axial load}}$$

Provide range of "permissible" loads and indicate how they are accommodated.

PSB 2.5.6.4 Design casing to prevent entry of moisture.

Provide speed reducers with jacking bolts of hot dipped galvanized mild steel allowing at least 100mm adjustment up and down.

Equip the housing with a breather, drain and oil level plugs all accessible above the mounting frame.

PSB 2.5.6.5 Provide reducer with lift lugs.

Provide speed reducers equipped with an effective and accessible oil filling plug, oil level indication mechanism and a drain plug, as well as oil pressure indicators and oil pressure switches.

Locate all bearings within the speed reducer to allow for lubrication by means of a positive splash-action system.

Allow for easy control of oil levels.

Provide grease pump driven by the movement of the speed reducer if certain bearings require greasing.

Install the speed reducer with a nameplate showing at least the following information:

- (i) Speed reducer type or model number.
- (ii) Serial Number
- (iii) AGMA rating
- (iv) Nominal rating
- (v) Approximate oil quantity required.

PSB 2.5.6.6 Bolts

- Provide holding down bolts to be built into concrete work for securing the plant.

- Grouting up of the holding down bolts will be done by the Civil Contractor after completion of setting up of the plant by the Contractor under this Contract.

PSB 2.5.7 ELECTRICAL INSTALLATION

Supply, install and connect the electrical cables between the motors and the distribution board.
Provide a waterproof cable connection at the electrical motor.

PSB 2.5.8 SPARE PARTS

As recommended by the supplier and if specially ordered by the Engineer.

PSB2.6 SURFACE AERATORS

PSB 2.6.1 SCOPE

This section of the contract covers the supply, delivery, erection, installation, testing and upholding during the Period of Maintenance of six mechanical aerators, with its electrical motors and gearboxes.

PSB 2.6.2 REQUIREMENTS OF THE AERATORS

Five vertical shaft slow speed surface Aerators are required.

The mechanical aerators shall be of robust construction and made of mild steel. The aerators shall be of the bridge mounted slow speed type, suitable for surface aeration. All metal surfaces shall receive corrosion protection as follows:

Mild steel components are to be sand blasted to SA3 standard and coated with a twin pack epoxy to a dry film thickness of 250 microns.

Tenderers shall provide a report on the performance characteristics of the aerators.

The aerator shall be controlled from the main control panel, but provision shall be made for local stop/start lock out facilities.

Aerator starters shall be equipped with allowing the aeration to be controlled relative to the loading concentration coming into the plant, resulting in a significant energy saving over the life cycle of the plant.

Adjacent aerators shall be contra-rotating.

The aerator shall be of self-cleansing, axial flow, open type. The supporting plate and aerator blades shall be of steel and shall allow a high flow of liquid high pumping rate through the unit and shall be designed to prevent cavitation. Full details of the impeller design shall be supplied with the tender.

The aerator impeller shall be accurately coupled with a bolted flange to a tubular drive shaft, which shall be adequately designed to withstand the combined torsion and bending moments encountered during operation. The design of shafts and bearing shall be calculated to allow for maximum stiffness, life and overhung load capacity for the unit

The following rotating speed parameters shall apply:

Aerators of 45kW and below – Maximum 5m/s tip speed, with maximum acceptable rotational speed of 50rpm

Speed Reducers shall be selected for continuous operation of 24 hours per day. Mechanical power ratings (according to AGMA rating) shall be greater than 2.0 times the Installed power and shall account for D.O.L. starting of the unit at full load conditions (maximum immersion).

All speed reducers must be provided with jacking bolts of HDG allowing at least 50mm adjustment upwards and downwards.

All speed reducers must be provided with jacking bolts of HDG allowing at least 50 mm adjustment upwards and downwards.

The speed reducer shall be fitted with an effective and easily accessible from the working platform, oil filling plug, oil level indication mechanisms, oil drain plug and breather. Speed reducers that have pumped spray systems shall have oil pressure indicators and oil pressure limit switches fitted for protection purposes.

The speed reducer output shaft arrangement shall be of the traditional dry well type i.e. where oil containment is by a well internal to the gearbox and not by an oil seal. The output bearing will therefore be manually greased and shall have a seal both below and above the bearing. The greasing point shall be easily accessible from the working platform.

All bearings and gears located within the speed reducer that are not submerged shall be lubricated by means of a positive splash-action system or a pumped spray system.

The motors shall be in accordance with the requirements of PMA 4.2 and shall not draw more than 90% of the rated power at maximum stated immersion depth. The aerators shall be so installed that maximum power is drawn by all aerators at the same top water level.

The motor shall be mounted to the speed reducer via accurately located lantern housing. A precision high speed flexible coupling, incorporating rubber buffers shall transmit power from the motor to the speed reducer.

PSB 2.6.3 SERVICE CONDITIONS

The aerators are to be based on the following design assumptions:

DESCRIPTION	UNIT
Aerobic Reactor Volume	6400m ³
Aerobic Reactor Liquid Depth	5m
Freeboard	1m
Number of Aerators Required	5
Minimum Mixing Intensity required	30W/m ³
Minimum Output each aerator for mixing only	38kW
Design Temperature	14°C
Maximum Oxygen Demand	273kg/h
Alpha-factor	0.85
Betha-factor	0.95
Altitude of Plant	1012m
Barometric Pressure at altitude	877mbar
Power requirements per Aerator	55kW
Overflow Weir Length	10m
Overflow Weir Status	Static weir

PSB 2.6.4 DRAUGHT TUBES

Aerators shall receive draft tubes.

The configuration of the draught tubes shall be such as to ensure effective mixing at a minimum emersion depth.

Tenders to specify offered draught tubes in the Data Sheets.

PSB 2.6.5 OXYGENATION

Oxygenation efficiency shall be expressed as kilograms oxygenation capacity per kilowatt-hour i.e. as the mass of oxygen measured in kilograms which the aerator can introduce over a period into a body of completely deoxygenated water, divided by the power input to the motor over the same period, measured in kilowatt-hours. The aerators must be able to supply the peak oxygen requirements to the mixed liquor at the specified minimum D.O. concentration. For this contract, the oxygenation capacity of an aerator is defined as the mass of oxygen (in kilograms) that the aerator can introduce per hour at 20°C and 760mm pressure into tap water containing no surfactants, zero dissolved oxygen and not more than 1000 mg/l of dissolved solids.

The Tenderer shall submit independent test data relating to the capacity (O.C.) of the equipment offered. In specifying the clean water oxygenation capacity of equipment, Tenderers should note the following:

The oxygenation capacity at standard conditions of 20°C, 760mm Hg pressure shall be based on peak demand.

The oxygenation capacity shall be such as to always ensure a minimum dissolved oxygen concentration of 2 mg/l at all points in the aeration tank.

The peak oxygenation supply requirement and the specified dissolved oxygen concentration requirements shall be satisfied at all temperatures between 12°C to 22°C.

The value of the alpha and beta factors shall not exceed those given in Section PSB2.6.3.

Tenderers shall submit independent test data relating to the oxygenation capacity of the equipment offered. Oxygenation capacity testing on site will be carried out using the steady state method and shall be carried out in the presence of the Contractor.

PSB 2.6.6 CERTIFICATION

Tenderers shall provide proof or sufficient evidence of oxygenation capacities and oxygenation efficiencies (for instance by submitting a report on performance by some recognized testing organization) and must state clearly how aerator performance was assessed.

PSB 2.6.7 MANUFACTURER PREFERENCES AND OTHER DATA

Corrosion protection	Coal tar epoxy coating, DFT>350µm
MOTOR	
Manufacturer	Only Zest
Motor protection	Anti-condensation heaters, PTC Thermistors 1/phase, oil pressure switches
GEARBOX	
Manufacturer	Only Siemens, SEW or Bonfig

PSB2.7 AXIAL FLOW MIXED LIQUOR RECYCLE PUMPS

PSB 2.7.1 SCOPE

This section of the contract covers the supply, delivery, erection, installation, putting into satisfactory operation, testing, and upholding during the Period of Operation Service of the following electrically driven, axial flow mixed liquor recycle pumps:

1. a – Recycle Pumps: Aeration to Anoxic Reactor: 3 pumps (2 operational; 1 standby)

2. RAS Pumps: Clarifiers to Anaerobic Reactor: 3 pumps (2 operational; 1 standby)

PSB 2.7.2 THE DRIVING HEAD

The driving head shall consist of a framework incorporating at its upper and lower ends plumber block bearing, each consisting of a spherical bearing assembly with locking bush. The upper shaft shall be carried in these bearings.

The upper bearing will be effectively locked to the shaft and carry all axial loads, whilst the lower bearing can float axially within its housing to accommodate any thermal expansion.

Both bearings shall be spherical double rows of self-aligning units and be sealed against the ingress of liquid. They shall be selected with a B-10 life more than 100 000 hours.

For ease of lubrication the bearing grease pipes are brought up to grease nipples on the outer cover. At its lower end the driving head shall incorporate a gusseted rectangular mounting flange which is suitable for bolting to the two steel supporting channels. The bearings shall be grease lubricated above the mounting flange.

PSB 2.7.3 MOTOR AND DRIVE

The upper end of the driving head shall incorporate an adjustable bracket for mounting the drive motor giving easy adjustment of "V" belt tension and changing of pulleys. The guards shall be designed to avoid water contamination of the "V" belts and upper bearing whilst allowing adequate air-cooling for the belt.

The motor power shall be transmitted to the driving head shaft by adequately rate "V" belts such that should one belt break the remaining belt/s will transmit the required power without overload. The motor shall be rated with at least a 1,10-service factor on the maximum absorbed power and be adequate weather proofed for use outdoors.

PSB 2.7.4 PROPELLER SHAFT

The propeller shaft shall be constructed from heavy-duty steel tubing to minimize deflection whilst running and be fixed to the upper shaft with a precision machined rigid coupling incorporating a spigot location. Both shafts and coupling shall be designed to transmit the required torque to the propeller and withstand all cantilever loads imposed under any extreme circumstances during operation.

PSB 2.7.5 PROPELLER BLADES

The propeller blades shall be manufactured as two separate, diametrically balanced helices. Each helix shall be welded to the tubular shaft and will incorporate a gradual taper from the shaft so that the collection of rags or other materials is impossible.

The propeller blades shall be cast in stainless steel.

PSB 2.7.6 THROAT TUBE

The throat tube which shall be constructed from painted mild steel will provide a duct within which the propeller shall operate. A small clearance between the propeller and throat tube shall ensure that a minimum of liquid slip takes place thus maintaining a high efficiency.

PSB 2.7.7 OPERATION

The rotational speed shall be varied relatively easily by changing the pulley size. Increasing the rotational speed shall increase the generated head and discharge quantity.

PSB 2.7.8 PROPOSED MATERIAL OF CONSTRUCTION

Driving Head Framework	M.S. Painted
"V" Belt Guard	M.S. Painted
Shaft	Bright carbon steel
Propeller	Grade 304 Stainless steel
Throat Tube	Mild Steel H.D. Galv.
Support Channels	Mild Steel H.D. Galv.
Bolts and Nuts below Platform	Grad 304 Stainless steel
Bolts and Nuts above Platform	Mild Steel H.D. Galv.

PSB 2.7.9 TECHNICAL DATA

The following table presents the design requirements:

Recycle Reference	From	To	Pump Rate per Pump (L/sec)			Total Head m
			Min	Max	Design	
a - Recycle	Aerobic	Anoxic	125	155	139	0.4
RAS	Clarifiers	Anaerobic	35	55	46	1.1

PSB 2.7.10 CONTROL OF PUMPS

These pumps shall be controlled manually although control of these pumps shall be from the main control board, a local stop/start lockout facility shall be provided.

PSB2.8 PUMPS AND ASSOCIATED PIPE WORK AND SPECIALS

PSB 2.8.1 SCOPE

This section of the contract covers the supply, delivery, erection, installation, putting into satisfactory operation, testing, and upholding during the Period of Operation Service of the following electrically driven pumps:

PSB 2.8.2 WAS PUMPS

Two centrifugal pumps (one a standby) to pump settled activated sludge Sludge Drying Beds.

The pumps permitted will be Gorman Rupp or Cornell and the pump protection, level control and pipe material will be as per the table below. This tender calls for the following pumps and motors to be provided under this contract:

Manufacturer	Gorman Rupp (GR) or Cornell
Model no if GR	T4CSC-B-4 (GR)
Quantity	1 Duty plus one standby
Liquid Pumped	Settled Activated Sludge
Flow Rate	15L/sec at 5m total head

PSB 2.8.3 DEWATERING PUMP

One submersible pump installed in a 1000mm diameter x 6m deep prefabricated concrete ring manhole shall be provided to pump collected subsoil drainage water from the Biological Reactor and Clarifiers underfloor to the head of the Biological Reactor. The technical information are as follows:

• Manufacturer	Grundfos or similar approved
Model no.	SV014BL (Grundfos S-Peller)
Quantity	1 duty
Liquid Pumped	Underflow
Flow Rate	6l/s per pump – Duty @ 8m maximum
Delivery Pressure	8m
Motor	Minimum 2.2kW
Pump protection	Motor overload, motor heater and thermistors and ultrasonic level control
Level control	Ultrasonic Autento or Endress and Hauser, Mounting bracket

PSB 2.8.4 SCUM REMOVAL PUMP

One submersible pump shall be provided to pump scum collected in a 1500mm diameter x 2.5m deep prefabricated concrete ring manhole, from the surfaces of Secondary Clarifiers 3 and 4 to Sludge Drying Beds designated for scum dewatering.

• Manufacturer	Grundfos or similar approved
Model no.	SV014BL (Grundfos S-Peller)
Quantity	1 duty
Liquid Pumped	Scum
Flow Rate	4L/s per pump – Duty @ 6m maximum
Delivery Pressure	6m
Motor	Minimum 2.2kW
Pump protection	Motor overload, motor heater and thermistors and ultrasonic level control
Level control	Ultrasonic Autento or Endress and Hauser, Mounting bracket

PSB 2.8.5 PIPING AND SPECIALS FOR PUMPS

Pipe work shall be designed by the mechanical contractor to minimise head losses and promote non-turbulent flow conditions with minimal flow velocities. The arrangement is such to facilitate dismantling and inspection. All pipes up to and including ND150 will be fabricated from SABS 62, medium wall pipe and will be hot dip galvanised after fabrication to ensure a pin-hole free coating. Flanges conform to SABS 1123 T1000/3.

Pumps are equipped with suction & discharge isolating valves as well as discharge check valves. Each pump is fitted with a Φ 100mm glycerine-filled pressure gauge c/w with chemi-seal and stop-cock on the suction and discharge.

For the subsoil drainage submersible pump, 6m of 80mm diameter flexible hosing will be required with a quick release coupling to the 80NB steel pipe, cast into the wall.

For the scum removal submersible pump, 2.5m of 80mm diameter flexible hosing will be required with a quick release coupling to the 80NB steel pipe, cast into the wall.

PSB 2.8.4 DRIVE TRANSMISSION FOR AXIAL FLOW PUMPS

Power shall be transmitted from motors to pumps by means of V-belt drive assemblies. The drive assemblies must be selected to establish proper pump speed to meet the specified operating conditions.

Each drive assembly shall have a minimum of two V-belts. In no case will a single belt drive be acceptable. Each V-belt drive assembly shall be selected on the basis that adequate power will be transmitted from drive to pump.

Drive systems with a safety factor of less than 1.5 to 1 shall not be considered sufficient for the service intended. Computation of safety factors shall be based on performance data published by the drive manufacturer.

PSB 2.8.5 AIR RELEASE VALVES

Each delivery line shall be equipped with one automatic air release valve (Vent-O-Mat Series RBX or similar approved), designed to permit the escape of air to the atmosphere during initial priming or unattended repriming cycles. Upon completion of the repriming cycle, the valve shall close to prevent recirculation. Valves shall provide visible indication of valve closure and shall operate solely on discharge pressure. Valves which require connection to the suction line shall not be acceptable.

PSB 2.8.6 INTERNAL PIPE WORK DESIGN

Internal pipe work is defined as all steel suction and delivery pipes, specials, and valves in steel around the pump station from where it joints up with the existing internal pipe work up to the point where it joins with the buried pipe works provided under the Civil Engineering section, including the final connecting coupling.

A schematic drawing indicating the internal pipeline configuration complete with required pipeline, bends, pipe specials, pressure gauge, shut-off valve, reflux valves and air release valves (suitable for Wastewater and sludge) is attached per pump set showing diagrammatically the type of pipe materials. The successful Tenderer shall provide a detailed layout drawing within 28 days of award of Tender.

Bends and braces shall provide non-turbulent flow conditions and the layout of pipe work shall be such to facilitate dismantling and inspection.

The pipes shall be properly supported and so arranged that all stresses created in the pipelines by static and dynamic forces, including recoil shock, be taken up by suitable anchors.

Cast iron valves shall not be supported by the pipe work but shall be supported external to pipe work by suitable galvanized brackets.

PSB 2.8.7 IDENTIFICATION PLATE

The following information must be provided on an easily visible identification plate on the pump:

Manufacturer's name, pump model and serial number
Supply contract number
Country agency
Country of origin
Year of manufacture
Duty of pump at _____ l/sec
Duty of pump at _____ m.head
Duty of pump at _____ r.p.m.
Impeller diameter _____ mm

PSB 2.8.8 TESTING

On completion of installation when putting into proper operation of the pumping installations, the Contractor will be required to make suitable arrangements for the testing of the plant and equipment supplied under this Contract, in the presence of the Engineer or his so as to determine whether they are in compliance with the guaranteed figures submitted by the Contractor.

PSB 2.8.9 PUMP SPARES

The Tenderer shall submit a complete list of all pumps, gearboxes and motor spare parts which are not regularly kept in stock by the supplier and which the Tenderer considers to be necessary for the replacement of wearing parts.

PSB2.9 WEIRS AND SLUICE GATES

PSB 2.9.1 WEIRS

Weirs in 304SS material will be required; 4.5mm thick plate and 250mm high. It shall have slots for adjustment where specified on the drawings and only wedge stainless-steel expansion bolts may be used to fix it to concrete work (M8 or larger). It will be required with smooth edges or V-notch (as per drawings) as per the schedule below.

Ref No	LOCATION	TYPE	LENGTH m	QTY
W1	Inlet Works Outlet Box	Smooth Edge	4	2
W2	Inlet Works Outlet Box	Smooth Edge	2	1
W3	Anoxic Reactor Outlet	Smooth Edge	6	1
W4	Aerobic Reactor Outlet	Smooth Edge	10	1
W5	Secondary Clarifier Overflow	V-Notch	77	2
W6	New Chlorine Contact Channels Outlet	Smooth Edge	1.5	1

PSB 2.9.2 SLUICE GATES

PSB 2.9.2.1 Design, Construction and Operating Equipment

All parts are designed for the duty required, with a minimum factor of safety against structural failure of not less than 3, based on the working stress of the material.

In the design, due consideration has been given to the thickness of materials regarding corrosion and operating conditions. The maximum force required at a hand wheel or crank to raise a gate does not exceed 120N.

All gates are well guided with minimal possibility of jamming. The sluice gates offered are of the level invert type fitted with renewable seals of a non-biodegradable material on the invert.

All hand operated Sluice Gates shall have rising spindles, manufactured in grade 304 stainless steel and hand wheels.

The invert seal should be of the rectangular type. The hand wheels should be located 300mm above the platform or grid level. Enough spindle guides and wall brackets shall be provided to ensure smooth operation of the spindle mechanism.

PSB 2.9.2.2 Sluice Gate requirements

Reference No	S1	S2	S3	S4	S5	S6
Location	Inlet Works		Inlet Works Outlet Box		Biological Reactor to Clarifier Division Box	
Quantity	4	2	1	1	1	1
Type	Rising Channel Gate		Wall mounted rising sluice gate with extended spindle and flush invert			
Channel or Box Depth mm	800	800	2500	2500	2000	2000
Max. Liquid Depth mm	450	400	1300	1300	1000	1000
Width of Opening mm	400	450	550	400	800	800
Depth of Opening mm	500	450	550	400	350	350
Side Support of Frame	Recessed into channel walls		Both sides of wall			
Bottom and Top Support of Frame	Recessed into channel floor		Top and bottom wall support			
Spindle Diameter mm	30					
Seating	not applicable		Seated		Unseated	

PSB2.10 LIME STORAGE AND DOSING EQUIPMENT**PSB 2.10.1 SCOPE OF WORK**

Hydrated lime shall be added at the Flow Distribution Box to increase the alkalinity of the influent to enable nitrification of the ammonia in the inflow. It has been calculated that for the 10ML/day inflow, 1240kg/day needs to be dosed.

The tenderer shall specify in the Data Sheets which dosage and storage equipment he proposes for this purpose. A concrete slab shall be provided under the civils section.

PSB 2.10.2 DESIGN OF LAYOUT

The successful tenderer shall present a schematic design of the layout of the storage and dosing arrangement, indicating all valves, gauges, strainers and sizes of inlet and outlet piping, all within 60 days from award of the tender.

PSB2.11 MISCELLANEOUS**PSB 2.11.1 SKIPS**

Four 6 m³ steel skips shall be provided for screenings and grit plus two trailers equipped with hydraulic hoist equipment to handle one skip.

PSB 2.11.2 GRP GRATING AND SUPPORT

GRP gratings: 38mm deep x 38 x 38mm openings, ISO 9000 quality, in green colour with gritted surface, shall be installed where specified on drawings. The gratings shall be supported on a galvanized steel 40 x 40 x 3mm angle iron frame installed in 50 x 50mm recesses formed in the concrete. The frame shall be anchored into the concrete by galvanized 100mm long x 30mm wide x 2mm thick lugs welded onto the frame around its perimeter at not less than 500mm centres and which will then be grouted into the concrete.

Measurement and payment shall be for the supply and manufacture of the frame and cutting of the grating and grouting in of the frame into the concrete, including the forming of pockets for the holding lugs.

PSB 2.11.3 LABORATORY EQUIPMENT

The following laboratory equipment will be required:

- Hach DR 3900 spectrophotometer with COD fermenter – 1 of
- Hach DR 3900 spectrophotometer (ammonia, nitrates and phosphates) - 1 of
- Free chlorine meter - 1 of
- Multi meter (pH and conductivity) - 1 of
- Imhoff cones - 5 of

PSB2.12 CLARIFIERS

PSB 2.12.1 SCOPE

This section of the contract covers the supply, delivery, erection, installation, testing and upholding during the Period of Operation Service of equipment for two continuous rotating scraper type clarifiers.

PSB 2.12.2 DESCRIPTION

The clarifiers will be for the clarification of the mixed liquor derived from the aeration basin. The tanks shall each have an internal diameter of 26 m and a side water depth of 4m and shall have a sludge scraper mechanism. The peak anticipated feed rate to each clarifier shall be 167 litre/sec.

The design of the tanks offered shall be such that the possibility of short circuiting of the flow, whether along the surface or along the floor, is reduced to a minimum.

PSB 2.16.1 BRIDGE AND ANCILLARY EQUIPMENT ON CLARIFIERS

The bridge shall be of mild steel beam, construction with proper surface protection as specified and shall form or incorporate an access walkway of not less than 750mm in width, designed to operate satisfactorily under live load of 250kg/m². The deflection, without taking into consideration the live load shall not exceed 1:320 of the span. The bridge shall be manufactured with a positive camber to compensate for the deflection under the dead weight of the unsubmerged bridge. Flooring to the walkway shall be SS304 stainless steel grating and the bridge shall be capable of supporting the worst-case live load with a maximum deflection of 10mm, horizontally as well as vertically. The direction of the supporting bar shall be transverse to the longitudinal axes of the bridge. All grating shall be free of torsion and supported on all sides and secured by means of stainless steel 304 clamps and bolts. The walkway shall allow access to the centre bearing assembly and annular stilling chamber. Tubular hand railing shall be provided on either side of the walkway complete with a 75 mm continuous kicker plate.

The bridge shall be supported at the centre by a reinforced concrete centre column, to be constructed by the Civil Contractor. The centre of the bridge shall be mounted on a slewing ring hinged bearings of robust and adequate rating for the application. The base of the slewing ring shall be bolted to the top of the concrete centre column.

The top of the slewing ring shall be fixed to the underside of the bridge. The slewing ring shall be well clear of the maximum water level.

Materials and dimensions for the various elements shall be:

TECHNICAL DATA	
Number of Clarifiers	2
Clarifier Diameter	26m
Side Wall Height of Clarifier	4m
Total Water Height of Clarifier	4.93m
Bridge minimum walkway width	750mm
Bridge Section Size	600 x 120 x 6PBC
Stilling Basin minimum Diameter	5m
Stilling Chamber Depth	2.6m
Minimum Scraper Depth	500mm
MATERIALS OF CONSTRUCTION	
Energy dissipating inlet	Gr300W steel - Coal tar epoxy coated
Rotating Half Bridge	750mm Wide GR300W - UV resistant polyurethane coated (Carboline 134)
Walkway Grating	GRP
Hand Railing	Mild Steel - hot dipped galvanised
Sludge Scraper Blades	300 x 4.5mm - 300W coal tar epoxy coated
Scum Collection Box	Mild Steel - hot dipped galvanised
Installed Motor Power	0.75kW x 4p, 400V x 3ph, IP55
Gearbox	Siemens or SEW
Bridge Peripheral Speed	2.5m/min

Peripheral drive units for scraper bridges are the preferred drive configuration. The drive shall be through a neoprene or polyurethane tyre steel wheel suitable for running on the outer wall of the tank. In addition to this driving wheel, there shall be at least one trailing or idling wheel. The drive wheel shall be located at the front to maximize traction due to bending moments when excessive sludge loads are encountered by the scrapers. The bridge shall be capable of maintaining stable operation under these conditions. The front wheel shall be preceded by a guard designed to push away any object left on the wall to the outside of the running surface and off the wall. No track will be provided. The bridge shall be designed to prevent any contact between the steel scraper supports and the concrete floor in the event of any wheel losing its wearing surface. Viewed from above, the scraper bridge shall be driven in a clockwise direction.

The drive motor, drive shaft and bearings shall be arranged to allow convenient replacement of the wheel without complete disassembly and re-alignment of the wheel. The lead and trail wheel shall be accurately aligned relative to the pivot point to minimize wear. Both wheels shall be enclosed in a protective cover. Clearance between metal elements of the bridge structure drive units and scrapers and the civil structure shall be such that no metal contracts result from the loss or wear of the drive and/ or trail wheel tyre.

Centre drive units operate through a reduction gearbox onto a ring gear of adequate size from which the torque framework shall be suspended. No submerged gears, bearings, drive or guide wheels will be acceptable.

Lubricating points on the drive mechanism and wheels shall be positioned such that no grease is deposited on the wheel support concrete surface, and such that all lubrication points can be accessed without any dismantling.

Gearboxes shall be of the high efficiency type with a minimum service factor of 2.0 on installed power. All bearings shall have a minimum rated life of 100 000 hours (B-10).

Shear pins or other approved safety device shall be incorporated in the drive unit to stop the mechanism immediately should any portion become jammed.

Power supply of the drive motor shall be through an electrical pick-up unit at the centre of the bridge. The pickup unit shall have a separate earth ring.

Slip rings shall be provided for all additional elements if required. Current into the pickup shall be obtained from a cable feed, supplied by the Electrical Contractor.

PSB 2.16.2 STILLING CHAMBERS

Stilling drum is to be designed as a fat trap and is equipped with a cam activated scum draw off. The cam length is to be adjustable

Inflow from the inlet pipe shall be deflected downwards by a stilling chamber in 6mm mild steel, painted carbomastic 200, 350micron.

Vertical rods shall be attached to the bridge spaced at not more than 750mm and shall extend down into the stilling box to break up any scum accumulating therein. The diameter and depth below water level of the annular stilling chamber shall be designed by the Contractor to disperse the inflow with the minimum amount of bottom scour and surface eddies. The design shall be approved by the Engineer before any fabrication is implemented.

PSB 2.16.3 WEIRS

Weir plate shall be V-notched and shall be fixed to the concrete channel.

The overflow weirs shall be adjusted against actual hydraulic overflow conditions. Final adjustments to the overflow weir levels shall be done with a filled tank. With the water surface lowest V-notch inverts shall be adjusted to within 5mm of the water surface.

PSB 2.16.4 TESTING

To establish the performance of the equipment, the Contractor shall carry out in-situ tests that are witnessed by the Engineer. Full details of tests and the calculated results shall also be handed to the Engineer. The Contractor shall provide all calibrated and other equipment and staff necessary to conduct the tests.

Site testing under operational conditions shall include the following minimum operations:

- a) Measurement of power absorbed by electric motor at design load.
- b) Rotational speed of bridge.
- c) Smooth operation of bridge.
- d) Measurement to confirm the accuracy of V-notch invert levels.

PSB 2.16.5 CONTROL OF CLARIFIERS

The clarifier shall be controlled manually from the main control panel. A local stop/start lockout shall be provided at the bridge access.

PSB 2.17: CHLORINATION

PSB 2.17.1 SCOPE

This section of the Contract covers the supply, delivery, installation, putting into satisfaction operation, testing, and upholding the Period of Operation Service of chlorination equipment for the whole Works.

PSB 2.17.2 DOSING RATE

The design and layout of the dosing system shall allow for the eventual peak effluent flow of:

Peak: 232L/sec

Average: 116L/sec

The dosing equipment will be sized to dose up to 8mg/l at the 10ML/D average flow. This represents 3,3kg/hour.

Accurate dosing down to 10% of the maximum dosing rate shall also be possible.

PSB 2.17.3 CHLORINE DOSING EQUIPMENT

The chlorination system shall be set up in two identical banks of chlorine gas containers configured as duty and stand-by. Each bank will consist of at least 4 x 70kg chlorine gas containers (gas cylinders not required under this contract). The cylinders on each manifold will be connected in parallel. Each manifold will be equipped with a vacuum regulator, complete with a 16Bar manometer. An automatic vacuum change-over device is required to enable continues chlorination when one bank is empty, so that the draw off is automatically switched to the full stand-by bank of chlorine containers.

The dosing rate is to be controlled by a single a single dosage regulator. The vacuum to operate the chlorination system is generated by a single injector.

The equipment is required to administer chlorine at a manual set ratio (mg/l) but with the dosing rate (quantity of chlorine) automatically adjusted in accordance with the actual flow of the effluent. The system required is normally referred to as a "paced-to-flow" system. It is designed to automatically adjust the chlorine dosing regulator utilising a 4-20mA signal from the final effluent flow meter, to match the dosing rate with the flow rate to prevent wasteful over dosage of chlorine.

Care shall be taken to obviate the possibility of leakage of chlorine gas under all possible conditions likely to be encountered during operation of the plant. All materials used in the manufacture of equipment and pipework shall be resistant to the corrosive action of chlorine.

PSB 2.17.4 MOTIVE WATER FEED SYSTEM

An electrically driven pumping set (one duty plus one standby pump) shall provide motive water to the chlorination system. The motive water shall be extracted at the end of the new chlorine contact tank, immediately before its overflow weir. The pumps shall both be connected to the chlorine dosing system.

As the effluent may contain suspended solids, an in-line strainer, 50mm diameter with 1mm apertures, including a manual flushing valve shall be provided on the motive water delivery line.

As a further precaution, "no-flow" protection of the pumps is required at the control panel.

PSB 2.17.5 WEIGHING APPARATUS

Chlorine gas shall be provided in 70kg cylinders (not part of this contract) and the gas available at any given moment in a 4-cylinder bank shall be determined by weighing one of the four cylinders of each bank.

Two load cells weighing apparatus (suitable for cylinders) each with a weighing capacity of not less than 200kg, are required for this purpose; one per bank.

A third similar scale will be required for weighing random unattached gas cylinders.

PSB 2.17.6 ACCESSORIES AND SAFETY AND EMERGENCY EQUIPMENT

The dosing room shall be continuously ventilated using a blower to pump fresh air into the chamber. Capacity of chamber: 22m³.

To be included, the following accessories and safety & emergency equipment to comply with safety regulations:

- Spanners to allow cylinder changes set
- Full gas mask (canister type) x2
- Canister for gas mask (chlorine gas use) x4
- Chemical gloves x2sets
- Set of safety signs (in English)
- Gas mask box with breakable glass and key

- Test ammonia kit

Further optional items:

- Full BA set with compressed air cylinder
- Disposable chemical suit
- Emergency seal off kit-A (1T cylinders)
- Drench safety shower with eye wash

PART C: ELECTRICAL

PSC1 - STANDARD ELECTRIC SPECIFICATIONS

1 ENGINEERING: ELECTRICAL WORKS

1.1 *Electrical scope of works*

The electrical scope of works shall comprise of the following items which are detailed in the subsequent sections.

- a) Liaise with the supply authority (Eskom) to coordinate relocation and/or upgrade of existing MV supply, equipment, and re-commissioning. Upgrade of existing 315kVA transformer to 630kVA transformer
- b) Liaise with the Client's (Rustenburg Local Municipality) Electrical Department to coordinate installation of new MV equipment and commissioning.
- c) LV Motor Control Centre (MCC)
- d) LV Chlorine Chemical Dosing Local Control Panel (LCP)
- e) Vendor packaged electrical control panels (covered under the mechanical section)
- f) Field Control Stations
- g) LV cables
- h) Cable supports
- i) Trenching
- j) Earthing and bonding
- k) 630kVA Standby Diesel Generator (canopy set)
- l) Small power and lighting
- m) 400V Small power and lighting distribution boards
- n) Testing and commissioning of the electrical installation.
- o) Certificates of compliance
- p) As-built drawings
- q) Operation and maintenance manuals
- r) Training
- s) Spares

1.2 *General*

- t) All supplied equipment shall be new and undamaged.
- u) The Employer shall have the right to request samples of equipment for approval prior to procurement and installation by the Contractor.
- v) The Contractor shall request a list of required samples from the Employer at the start of the contract to avoid delays.
- w) All equipment shall have a minimum guarantee period of 12 months from the date of issue of the certificates of compliance.

1.3 *Electrical Works Compliance*

1.3.1 *Specifications*

- a) The Waste Water Treatment Work's (WWTW) electrical installation shall be in accordance the relevant South African Nation Standards

1.3.2 Technical Datasheets

The electrical works will be provided in accordance with the following Technical Data Sheets:

- a) TD-EL -0001 Back-up Generator
- b) TD-EL-0002 LV Switchgear & Controlgear assemblies – Motor Control Centre
- c) TD-EL -0003 LV Switchgear & Controlgear assemblies – Local Control Panels
- d) TD-EL -0004 LV Electrical Motors < 50kW
- e) TD-EL -0005 LV Electrical Motors > 50kW
- f) TD-EL -0006 LV Cables and Cable Support
- g) TD-EL -0007 Distribution Boards
- h) TD-EL -0008 Small Power and Lighting
- i) TD-EL -0009 Lighting Schedule

1.3.3 Appended Tables and Schedules

The following tables and schedules are appended to form part of this project specification.

- a) MCC-MAIN tables and schedules
 - i. Motor and Equipment Schedules
 - ii. Motor and Equipment Cable Schedules
 - iii. Local Control Table
- b) These tables and schedules may alter depending on the actual mechanical equipment offered by the Tenderer. The Tenderer is responsible for pricing any changes to the electrical design that are caused by his/her selection of mechanical equipment.

1.4 Electrical Supply

1.4.1 General

- a) The supply authority for the Lethabong WWTW is Eskom.
- b) The Works electrical connection consists of an OHL, 315kVA floor-mount transformer and LV connection via drop-out fuses.
- c) The Contractor shall liaise with the supply authority to de-commission the existing floor-mount transformer and ready the OHL for the connection, termination and installation of a new metered 11kV point directly at the OHL.
- d) The Contractor shall terminate the new 420V LV supply cables at the new upgraded 630kVA transformer metering point to supply the Main MCC at the Works. LV site electrical installation to be liaised with the Rustenburg Local Municipality.

1.5 LV Switchgear & Controlgear Assemblies

1.5.1 General

- a) A new LV MCC-MAIN shall be installed in the new dedicated MCC room.
- b) The MCC shall be fed from the new 630kVA Eskom transformer.
- c) The existing MCC supply from the existing Eskom 315kVA transformer shall be decommissioned.
- d) The new MAIN MCC shall have a feeder circuit breaker to feed the existing MCC.
- e) The new MAIN MCC, MCC and field control table attached contains details of the starters, protection, metering instruments, push buttons, switches and or indication which shall be provided for the new MAIN MCC and local control panels.
- f) The new MCC shall be earthed to the main earthing bar which shall be installed in the new MCC room cable trench.

- g) The MCC Assembly shall consist of the following main components:
 - i. Main incomer section.
 - ii. Generator incomer section, including automatic changeover
 - iii. Power quality monitoring (over/under voltage, phase rotation, and including a digital power meter, connected to the PLC via serial communication).
 - iv. Functional units for the required incomer, pump motor starters, and other equipment.
 - v. Feeder to existing MCC.
 - vi. Feeder to building services distribution board (small power and lighting) as installed by civil contractor.
 - vii. Feeder to UPS in PLC panel (instrument, control voltage, and PLC power)
 - viii. Feeder to MCC Room A/C Unit.
 - ix. Feeders to other equipment as specified
 - x. Terminal strip per function unit for termination of all control wiring. All control inputs and outputs for motor controls shall be wired to the relevant PLC. The power supply (main circuit breakers open/close, control voltage, etc.) shall also be wired to the relevant PLC.
- h) Labels for the equipment on the new MCC shall have the following information:
 - i. Tag number (To be finalised with Client before printing to match Clients tagging structure if any. If there is no existing tagging structure, the new tags shall be workshopped with Client and final tags approved by Client)
 - ii. Description e.g., Surface Aerator No.1
 - iii. kW rating
 - iv. Full load current rating
- i) The existing MCC "Fed From" label shall be updated to indicate MCC fed from MAIN MCC.
- j) The Contractor shall provide stainless steel 316 steel top hat supports to support the weight of the panel over the trench. A top hat shall be provided at the end of each tier.
- k) GRP covers shall be provided for the trench in the MCC room.

1.5.2 Chemical Dosing Local Control Panel

- a) A local control panel shall be installed for each stand-by/duty set of chemical dosing pumps.
- b) The LCP shall consist of the following main components:
 - i. A switch disconnecter for the supply from MCC-MAIN.
 - ii. Functional units for the pump/motor starters.

1.5.3 Air-conditioning of MCC room

- a) Air conditioning (AC) units shall be provided for the new MCC room, new control room and new server room by means of wall or under ceiling mounted split units.
- b) The Contractor shall ensure that his/her air conditioner selection takes into account all the heat loads in the MCC room including the heat losses of the electrical equipment.
- c) Manufacturer's heat loss data of the chosen MCC equipment shall be used for sizing of the air conditioning units. The units shall not be rated less than 5kW.

1.6 Field Control Station

- a) Pedestal mounted field control stations shall be installed within arm's length of the installed motors/pumps as far as possible. Existing field control stations for existing equipment shall be inspected and tested and where required replaced.
- b) The field control stations shall be equipped with a field start and Estop as indicated on the attached MCC and field control tables.
- c) Where relevant, a forward/reverse field control station shall be provided to enable local control in both directions. To be non-latching type control.
- d) The LCP for the chemical dosing pumps shall serve as the field control stations for these pumps. The LCPs shall be equipped with an E-stop push button with the supply switched disconnect providing local isolation.

1.7 LV Cables

1.7.1 General

- a) LV multicore cables shall be copper conductor, PVC insulated cables with steel wire armouring
- b) Generator cables shall be fire resistant.
- c) Cables shall enter and exit the MCC and LCPs from the bottom of the panels.
- d) Where existing motors and cables are re-used (after cable tests), the existing cables shall be reconnected/extended to the new MCC, as per Cable Schedule. These cables shall be relabelled as per the new tag numbering structure.
- e) The single line diagram drawings and motor and equipment cable schedule (attached to the specifications) indicate the LV cables based on the Engineer's design. The actual cables shall be sized to power equipment offered by the Tenderer, satisfying the constraints specified by the Engineer in the cable schedule.
- f) The contractor shall develop a detailed design of the cable routes and lengths during construction and submit a cable route drawing and an updated cable schedule for the approval to the Engineer based on new equipment selected and existing equipment loads.

1.8 Cable Supports

1.8.1 General

- a) Stainless Steel 316 cable ladders shall be provided to support cables.
- b) Existing cable supports shall be re-used where possible and approved by the engineer, otherwise replaced.
- c) Conduits that are installed in concrete or brickwork shall be PVC.
- d) Surface conduits (if required) shall be hot dipped galvanized mild steel.
- e) Where the Contractor is required to carry out cable trenching, core drilling, chasing or the installation of sleeves, the Contractor shall coordinate such activities with the Civil Contractor.
- f) Cables installed in building cable trenches shall be secured to cable ladders. Cables shall not be laid on the floor of the cable trenches.
- g) The Contractor shall design detailed cable routes in collaboration with the Engineer. Detailed cable routes and cable ladder layout drawings shall be submitted for the Engineer's approval prior to installation.
- h) The Contractor in collaboration with the Civil works Contractor shall ensure that measures are taken to ensure water does not accumulate in the cable trenches and sleeves. If water ingress is inevitable a drainage system shall be put in place to easily extract the water.

1.9 LV Electrical Motors

1.9.1 General

- a) The MCC single line diagram drawing and the motor equipment schedules attached to the specifications indicate the Engineer's estimated ratings of motors and equipment. The actual rated power shall be selected by the Tenderer to suit the offered driven equipment.

1.9.2 Pump/Motor Protection

- b) Each Pump/motor set shall be supplied with the protection as shown on the process and instrumentation diagrams (PFDs) and single line diagrams.
- c) All motors shall have safety interlocks to prevent equipment damage even in the absence of a PLC. i.e. all safety interlocks (no flow switch or no pressure switches) to be hardwired back to the MCC motor starter wiring bucket.
- d) All motors above 45kW shall be equipped with single phase anti condensation heaters. The heaters shall be supplied from a separate terminal box to the motors.
- e) Motors rated above 50kW shall have PTC embedded in the stator windings. Two PTCs shall be provided per winding.

1.10 BACK-UP DIESEL GENERATOR

1.10.1 General

- a) A generator shall be provided to supply the plant during power outages
- b) The generator shall be an outdoor canopy set installed next to the new MCC building.
- c) The diesel generator installation shall comply with NRS 024-1:1994, SANS 8528 and technical datasheets.
- d) The generator configuration is shown on the MAIN MCC single line diagram drawing.
- e) A centralised standby generator shall be installed to supply power to essential equipment during a power failure.
- f) The generator control panel shall supply back-up power to the Main Distribution MCC (MCC-MAIN). Details to be finalised onsite.
- g) Transfer from generator supply to mains power and vice versa shall be automatic during a mains power failure with an option of manual starting.
- h) Generator changeover switch circuit breakers shall be installed in MCC-MAIN to provide the automatic changeover functionality.
- i) The Contractor shall provide a detailed procedure in the O&M manual which shall clearly detail the steps and checks in sequence that the operator(s) must take to safely switch loads from mains to generator power and back to mains when power is restored in both manual and automatic modes.
- j) The control and start-up of the process equipment when standby power is supplied, shall be controlled via the PLC.
- k) The Contractor shall commission the generator with full operational load for at least 30 minutes.
- l) The generator set base frame shall be earthed to the MCC building earthing bar.
- m) Dummy loads shall be provided, with variable resistive load banks switching in as necessary, to ensure the minimum loading of the generator set is never less than 40%.

1.11 LV Earthing and Bonding

1.11.1 Earthing Bars and Conductors

- a) A new MCC building foundation earth electrode shall be installed for the MCC building. An associated main earthing bar in this building shall also be installed in the cable trench in the MCC room. The Contractor shall therefore liaise and coordinate with the Civil Contractor to ensure connections to the earth electrode are provided in the required locations.
- b) Where supplementary earthing is required for equipment under this contract the Contractor shall provide it.
- c) Earth continuity conductors shall be provided with all the LV power cables to electrical equipment and as shown on the single line diagrams.
- d) Where no separate earth continuity conductor is shown on the single line drawing, the intention is that a spare core in the power cable shall serve this function.

1.11.2 Earthing and Bonding requirements

- a) All electrical equipment shall be earthed.
- b) All accessible extraneous conductive parts of electrical equipment/electrically-driven equipment shall be bonded in accordance with SANS 10142-1.

1.12 BUILDING ELECTRICAL COMPLIANCE

1.12.1 Building Cable and Wiring Installation

- a) Conduits in brick or concrete shall be PVC
- b) Where the Contractor is required to carry out cable trenching, core drilling, chasing sleeves or conduits, the Contractor shall co-ordinate such activities with the relevant sub-contractors.
- c) All wiring to light fittings, light switches and single-phase power outlets shall be done with PVC insulated house wire through PVC conduits. No surface mounted conduits will be allowed on walls.
- d) All conduit work at soffit level shall be surface mounted and of galvanized type (except in Administration building).
- e) All incoming sleeves and openings into or at concrete structures and into buildings shall be thoroughly sealed after the cable installation is complete to limit water ingress into sleeves, buildings and building trenches.
- f) All surface mounted conduits used for the installation of LV cables shall be hot dipped galvanised, except when installed in concrete then PVC conduits shall be used.
- g) As far as possible, no surface mounting shall be used by the Contractor for building services. The Contractor shall ask the Engineer for approval where he/she needs to install surface conduiting for such services.
- h) Double compartment grey PVC power skirting with cover shall be installed in the Administration building and control room. The bottom compartment shall be used for data and telephone communication wire and the top compartment shall be used for power cabling and wiring.
- i) Power skirting positions shall be subject to final locations of desks and equipment.

1.12.2 Power Outlets

- a) All single phase switched socket outlets shall be installed flush mounted into walls or power skirting.
- b) Industrial 3-Phase switched socket outlets shall be 32A 5-Pin IP55 (or higher) and surface mounted unless otherwise specified on drawings.
- c) Switch disconnectors shall be surface mounted and installed within arm's reach of the equipment it isolates. Where this is not possible, lockable type switch disconnectors shall be installed and a sign shall be provided to inform which equipment the isolator isolates.
- d) All switch disconnectors or power outlets installed outdoors shall be a minimum of IP 65 rated.
- e) Corrosion resistant outlets and switch disconnectors shall be installed in all corrosive areas and or as indicated on the drawings.

1.12.3 Lighting (Building interior and exterior)

- a) LED based light fittings shall be installed.
- b) Exterior lighting shall be controlled by means of a contactor (located in the DB) and photocell unless otherwise specified.
- c) Light switches for indoor lights shall be flush mounted.
- d) Power to the interior and exterior lighting shall be supplied by house wire.
- e) Details of luminaires to be installed are supplied in the technical datasheets.
- f) Samples of all light fittings shall be delivered to the Engineer for approval before orders are placed

1.12.4 Distribution Boards

- a) Flush mounted distribution boards shall be supplied as per below:

- i. MCC building located in the MCC room,
 - ii. Administration Building
 - iii. Inlet works located in the inlet works store room.
 - iv. Chlorine building located in the low pressure room
- b) All distribution boards shall be fed from the new MAIN MCC as shown on the MCC Single Line Diagram drawing.

1.12.5 Area Lighting Kiosk

- a) The streetlights and area lights shall be supplied from a kiosk.
- b) The kiosk shall be equipped with a photocell and bypass.
- c) The equipment for the kiosk shall be installed to match the single line diagram.

1.12.6 Heating, Ventilation and Air Conditioning

- a) The new Admin Building shall have a number of split air conditioning units.
- b) Each office/area shall have its own unit(s) supplied under this Contract.
- c) Units will range from 12,000 BTU to 18,000 BTU.
- d) Units shall be wall-mounted, with outdoor unit mounted externally, painted with anti-corrosion coating, complete with condensate discharge pipe through the wall.
- e) Holes through walls to be drilled through brickwork from outside to inside, with pilot hole drilled first (to prevent bricks cracking and breaking), and holes to be sealed with expansion foam and neatly finished.

1.12.7 Earthing and Bonding requirements

- a) All electrical equipment shall be earthed.
- b) All accessible extraneous conductive parts of electrical equipment/electrically-driven equipment shall be bonded in accordance with SANS 10142-1.

2 ENGINEERING: ELECTRONIC WORKS

2.1 *Electronic scope of works*

The electronic scope of works shall comprise of the following items which are detailed in the subsequent sections.

- a) Programmable Logic Controller
- b) Remote input output units (Remote IOs)
- c) Human Machine Interface (HMI)
- d) SCADA
- e) Remote Monitoring.
- f) Programming
- g) Uninterrupted Power Supply Units (UPS)
- h) Instrumentation
- i) Control, instrumentation and data cables
- j) Cable Supports
- k) Junction Boxes
- l) Earthing and surge protection of electronic equipment
- m) Functional Design Specification (FDS)
- n) Testing and commissioning of the electronic installation.
- o) Instrumentation Calibration Certificates
- p) Certificates of compliance
- q) As-built drawings
- r) Operation and maintenance manuals
- s) Training
- t) Spares

2.2 *General*

- a) All supplied equipment shall be new and undamaged.
- b) The Contractor shall request a list of required samples from the Employer at the start of the contract to avoid delays.
- c) All equipment shall have a minimum guarantee period of 12 months from the date of issue of the certificates of compliance.

2.3 *Electronic Works Compliance*

2.3.1 *Specifications*

- a) The Waste Water Treatment Work's (WWTW) electrical installation shall be in accordance the relevant South African Nation Standards.

2.3.2 *Technical Datasheets*

The electrical works will be provided in accordance with the following Technical Data Sheets:

- a) TD-CI -0001 Control, Instrumentation and Data Cables
- b) TD-CI-0002 Programmable Logic Controller
- c) TD-CI -0003 SCADA
- d) TD-CI -0004 Instrumentation

2.3.3 Appended Tables and Schedules

The following tables and schedules are appended to form part of this project specification.

- a) PLC tables and schedules
 - i. Control and Instrumentation table
 - ii. IO List
- b) These tables and schedules may alter depending on the actual equipment offered by the Tenderer. The Tenderer is responsible for pricing any changes to the electronic design that are caused by his/her selection of equipment.

2.4 Electronic Installation

2.4.1 General

- a) The control system architecture shows how the control and monitoring system of the waste water plant is connected.
- b) The plant shall be automatically controlled by a Programmable Logic Controller (PLC) located as part of the MCC metal work.
- c) The Contractor shall develop a detailed control system architecture for the works and his offered equipment and submit a diagrammatic representation thereof to the Engineer for approval prior to detail design and purchase of equipment, manufacture and programming of the control and instrumentation system.

2.4.2 System Voltages

- a) 230VAC for MCC contactor coils and MCC controls
- b) 24VDC for PLC
- c) 230VAC UPS supply
- d) 230VAC/24VDC for UPS supply to instrumentation power as required
- e) 24VDC for solenoid blocks
- f) 24VDC for digital inputs and outputs
- g) – 20mA current for analogue instruments

2.4.3 Control Cables

- a) Control cables shall be provided as detailed in the control and instrumentation cable schedule attached to the specification. The Contractor shall however develop a final cable schedule to suit his equipment offered under the tender and the Contractor shall be deemed to have allowed in his tender all control cabling required to complete the installation.
- b) Control cables shall be 600/1000V multicore standard copper conductors. PVC-insulated cables with galvanised steel wire armouring and PVC serving.
- c) All control cables installed outdoors or in the ground shall be armoured regardless of installation in sleeving or conduits.
- d) All cable glands shall be resistant to corrosion and shall be of the Enviro-gland or approved equivalent type.

2.4.4 Instrumentation Cables

- a) Instrumentation cables shall be provided as detailed in the control and instrumentation cable schedule attached to the specification. The Contractor shall however develop a final cable schedule to suit his equipment offered under the tender and the Contractor shall be deemed to have allowed in his tender all instrumentation cabling required to complete the installation.
- b) Instrumentation cables shall either be twisted pair or triad standard copper conductors, individually and overall screened, PVC-insulated with galvanised steel wire armouring and PVC serving.
- c) All instrumentation cables installed outdoors or in the ground shall be armoured regardless of installation in sleeving or conduits.
- d) All cable glands shall be resistant to corrosion and shall be of the Enviro-gland or approved equivalent type.

2.4.5 Data Cables

- a) Data cables shall be provided as detailed in the control and instrumentation cable schedule attached to the specification and architecture drawing. The Contractor shall however develop a final cable schedule to suit his equipment offered under the tender and the Contractor shall be deemed to have allowed in his/her tender all data cabling required to complete the installation.
- b) Armoured single mode fibre optic cable shall be installed on site where required.

2.5 Cable Supports and Cable Ways

2.5.1 General

- a) Control and instrument cables may be run on the same cable tray/ladder as power cables, except where electromagnetic interference may affect the instrumentation signals.
- b) Control and Instrumentation cables shall be installed at least 300 mm away from power cables. Where this is not possible, control, instrumentation and data cables shall be installed in dedicated cable trays.
- c) Stainless Steel 316 cable trays shall be provided to support cables.
- d) Existing cable supports shall be re-used where possible and approved by the engineer, otherwise replaced.

2.6 Control Panels

2.6.1 PLC Panel

- a) The new PLC panel shall be part of the new MCC panel.
- b) The panel shall house the PLC, HMI, direct current (DC) power supplies, instrumentation distribution and UPS.
- c) The new PLCs shall control and monitor the WWTW equipment.
- d) All motor starters, UPSs, power meters, remote IOs and instrumentation associated with the WWTW shall be interfaced and/or connected to the PLC for full automatic control and monitoring purposes.
- e) Full length doors shall be fitted to the front of the PLC panel with armour plated glass windows for viewing the status of the PLC as per the typical PLC panel general arrangement drawing.
- f) The price for the PLC panel shall be deemed to include for all mounting plates, DIN mounting rails, wire trunking, wiring, labelling, glands and internal peripherals as shown on the typical general arrangement drawing, control architecture drawing and described in this section. The price of the steelwork shall be included under the MCC.
- g) The enclosure shall be properly ventilated by extractor fans with dust filters. Cooling shall include adequate cooling for the UPS.
- h) The panel shall be large enough to allow for all required equipment plus 20% spare physical space.
- i) Power distribution and instrument supply circuit breakers shall be located in the front of the PLC panel.
- j) A separate protective earth bar (front) and an insulated earth bar (marshalling rear) shall be supplied at the bottom of the PLC panels.

2.6.2 Programmable Logic Controller Functionality

- a) The PLCs shall be programmed to execute automatic operations of the works according to the Engineer's specified control philosophy. This shall include both existing equipments and new equipments.
- b) The PLC software developed under this contract shall remain open source (i.e. unlocked) and become the property of the Employer and shall be included on a USB flash disk as part of the final Operational and Maintenance (O&M) manuals.

2.6.3 Inputs and Outputs

- a) The attached IO lists for the PLC shall only serve as a guide to Tenderers, and the Contractor shall be responsible for determining and providing all the required I/O including spares to provide the specified control and monitoring functions of his offered equipment.
- b) Digital input / output cards shall be 24 VDC and analogue input / output cards 4- 20mA current loops where signals from conventional process instrumentation are required.

- c) The input / output modules shall be provided with their own power supply independent from the CPU power supplies.
- d) The I/O list shall be finalised by the Contractor during the Contract and shall be submitted for approval by the Engineer before final design and programming of the PLC.

2.6.4 Uninterruptible Power Supply (UPS)

- a) The PLC shall be equipped with a UPS which shall provide power to the PLC, HMI, remote I/Os and instrumentation during mains failure for the minimum period specified in technical data sheets.
- b) An isolation transformer on the input side shall be included to ensure voltages remain constant when the neutral supply is cut during generator changeover.
- c) Adequate provision shall be made for ventilation of a UPS when it is installed in a PLC panel.
- d) The UPS system shall be tested on site and the Contractor shall ensure that the associated PLC and HMI shutdown and restart automatically without losing any information or requiring operator intervention should the UPS standby period expire before standby generator power is available.

2.6.5 Human Machine Interface (HMI)

- a) A colour touch screen graphical HMI shall be provided on the PLC panel. The HMI shall be configured to provide the operator with equipment control and status information, alarm lists, graphical trends and limited data logging.
- b) The HMI shall also allow control parameter changes to the PLC, which shall be password protected and logged. Operator actions, selections or setting updates described in the control philosophy shall be possible via the HMI interface.
- c) The HMIs shall be configured with a simple default graphic display (mimic) showing all relevant equipment of the works, its status (running, tripped or stopped) and instantaneous and totalised instrument readings.
- d) Mode selection on related electrical equipment (e.g. motor starters, control system mode, etc.) shall be clearly indicated on the HMI.
- e) Status shall be indicated by different state colours (such as white for ready, green for running, amber for tripped and red for 'E-stop' or other fault states).
- f) A trending page shall be provided showing all measured value readings over time. The trend page shall show live and historical data (which shall be logged to the HMI memory in a first in first out rolling log file). Trends shall be configured to show an hourly interval of readings.
- g) An alarm page shall be provided showing all outgoing and incoming alarms. Alarms shall also be stored in a first in first out file stored in the HMI memory. It shall be possible to scroll backward and forward in the alarm list.

2.7 SCADA

2.7.1 General

- a) A new standalone SCADA system, with hot-standby capability, shall be installed in the Administration building control room.
- b) The SCADA shall allow monitoring and control of the works.
- c) All information from the waste water treatment works shall be available at the local SCADA.
- d) All information visible at the Lethabong WWTW local SCADA, shall be available and added to the existing Municipal Master SCADA at Rustenburg for monitoring purposes only.
- e) The SCADA mimics will be reviewed by the Engineer before these are presented in the control system FAT or are implemented on site. Tenderers shall allow for at least three iterations in the design and review of the SCADA design and mimics.
- f) The Contractor shall allow for a complete control system software FAT for at least three persons as part of the software development.
- g) The Contractor's System Integrator (SI) shall involve the Original Equipment Manufacturer (OEM) for a consultation and specification meeting with the Engineer and Employer to confirm the SCADA architecture before any engineering commences. The OEM shall further be involved for fault finding and pre-commissioning testing on site.

- h) The Contractor shall allow for at least one scoping meeting between the Contractor, the SI, the OEM (Adroit), the Engineer and the Employer to finalise the scope and discuss the latest technology developments.

2.7.2 SCADA Software

- a) The SCADA package shall be the latest Adroit 10 (with Smart UI). The Contractor shall include the price for all required IO servers and control clients licensing (as per Architecture drawing) as well as at least 5 remote view client licenses under SCADA software in the BoQ based on a minimum count of 5000 tags.
- b) It shall be the Contractor's responsibility to derive all tags necessary for the local and remote SCADA systems to display, monitor, log, trend and record all information from the PLCs.
- c) Demand scanning of non-trending tags shall be utilised to reduce network traffic.
- d) The license shall be sufficiently sized to have at least 15% spare tags after commissioning.
- e) An Adroit Alarm Management system license shall be provided and setup as per the OEM guidelines to track and manage the plant alarm notifications.
- f) The Contractor shall provide all server and computer operating systems as well as anti-virus software.

2.7.3 Remote Monitoring

- a) The Contractor shall set up a web based remote monitoring of the SCADA and historian for the Employer and Engineer
- b) An intelligent remote access and networking device (Tosibox or approved equivalent) that serves as an endpoint for secure remote connections, shall be set up for the remote access of site data by the Operations manager and Engineer. The supervision network shall be securely accessed through this device via an encrypted VPN connection.
- c) The intelligent remote access device shall provide a VPN throughput of up to 15 Mb/s. The VPN authentication shall be provided via an access key or soft key licence that is linked to that specific intelligent remote access device only.
- d) The intelligent remote access device shall provide a built-in firewall (NAT) to enhance security of the site.
- e) The Contractor shall investigate if the site has suitable 3G coverage or recommend the usage of an ADSL fixed line or Employer's IT department fibre optic network.
- f) The intelligent remote access device shall have a web interface and PoE functionality.
- g) The Contractor shall provide all necessary accessories such as modem, antennas, mountings and wiring required by the intelligent remote access device. The device and ancillaries shall be installed in the admin building control room.

2.7.4 SCADA Mimics

- a) The SCADA mimics shall be based on the PFDs.
- b) All SCADA and HMI mimics will be presented to the Municipality (as part of the control and system functional design specification (FDS), generated by the contractor) for comments before development of the software commences.
- c) An overview mimic of the complete WWTW shall be programmed as well as detailed mimics of each process area.
- d) A mimic shall also be provided to indicate the status of all communications networks, electrical equipment (in single line diagram format), and control network (showing PLC and other electronic equipment statuses).
- e) The electrical reticulation mimic shall be provided, showing the status of all main LV breakers, transformer, generator and generator changeovers, etc. Additionally, this mimic shall show the energy consumption (also trend) of each assembly (mains and generator supply), UPS statuses etc.
- f) A navigation screen on the overview mimic shall be provided from where the operator can navigate from the overview to detailed screens for the auxiliary/common equipment and instrumentation not associated with a particular process area.
- g) The mimics shall be similar to the mimics shown on the HMI, but be more detailed and not be a direct copy of the displays shown on the HMI at the PLC.
- h) Historical and real-time trending will be provided for the following:

- i. Flow measurements
 - ii. Level measurements
 - iii. Chemical dosing
 - iv. Process indicative instruments
 - v. Energy Consumption
 - vi. Water and sludge quality
 - vii. All analogue values, including level, flow, pressure, vibration, speed and temperature
- i) All motor trip conditions and faults shall be processed by the PLC and sent to the SCADA alarming system and all operator actions to start, stop, reset, and change pumps parameters shall be event-logged on the SCADA.
 - j) SCADA user access security levels shall be as programmed accordingly from operator names provided by the Employer. The mimics for the SCADA and HMIs are an iterative process whereby the Engineer, Employer, and Contractor shall provide several comments before the mimics are finalised. Therefore, the Contractor shall allow for a minimum of five iterations to format and update the mimics until they meet the requirements of the Engineer and Employer.
 - k) Forms shall be developed on the SCADA for entering data manually collected from the plant such as process samples that are analysed in the laboratory. The Contractor shall allow for at least 30 tag values to be entered manually.
 - l) Maintenance requirements and status (includes last service/maintenance date, who performed service and details of maintenance; next service/maintenance date and warnings). All maintenance schedules from the O&M manuals will be available in electronic format on the SCADA. The SCADA and historian of the plant shall be integrated into the maintenance platform of the municipality with maintenance schedules (scheduled, preventative and reactive) being shown on the SCADA. Additionally, all maintenance logs shall be imported into this SCADA for record keeping. These logs will be developed in conjunction with the Employers maintenance departments and asset management department and will integrate with the Municipality's asset management system. Historian data shall be structured in a way for easy integration into the asset management data base in future.

2.7.5 SCADA Historian

The Historian shall be based on a Microsoft SQL database technology

A data warehouse specialist shall be employed to configure the historian.

The historian data warehouse shall include the following processes,

- v. Extract data from the SCADA SQL logging database,
 - vi. Staging (Cleaning data, null handling etc)
 - vii. Transform (Applying process rules to data, calculations, aggregation of data)
 - viii. Data warehouse data model configuration (Putting data into star schema, with fact tables and dimensions)
 - ix. Configuration of gateway to import data cube into visualisation/reporting software.
- d) The Historian data warehouse architecture and reporting/dashboard requirements shall be defined by means of an arranged workshop between the Employer, Engineer, and the Contractor's data warehouse specialist prior to final implementation and tested thereafter as part of the SCADA Factory and Site Acceptance Test.

2.7.6 SCADA Control Room and Furniture

- a) The Contractor shall allow for at least two meetings between the Contractor, the SI, the Engineer and the Client to finalise the Control Room layout and cable routing herein. A workstation and Control Room layout (showing all electronic equipment, power socket outlets and cable routes) shall be submitted by the Contractor for approval to the Engineer before procurement of any furniture.
- b) The SCADA furniture will be designed and supplied by a control room specialist. The layout shall be approved by the Client and Engineer.

- c) Furniture for the SCADA workstation shall include the following:
 - x. clean aesthetic look, matching the interior design and furniture colours of the rest of the Admin Building.
 - xi. durable materials (high-pressure laminate and wood veneers)
 - xii. Ergonomic designed chairs and control room desks.
 - xiii. rear access panels for desk
 - xiv. PC storage under the desk, hidden away
 - xv. Hidden cable management system
 - xvi. Back plate with cantilever arm to mount flat screens
 - xvii. Power distribution system behind or below desk

2.8 INSTRUMENTATION

2.8.1 General

The Contractor shall provide instrumentation that is not an integral part of mechanical equipment as indicated on the PFDs and the instrumentation lists attached to the specification.

If the Contractor deems additional instruments necessary that are not listed/shown as part of the PFDs or instrumentation list to ensure the safety and protection of equipment, he/she shall include each instrument as a line item in the additional section of the bill.

All instruments shall be supplied from UPS power unless they are potential free contacts or loop-powered by the remote IO units.

Instrumentation shall be connected to the PLC/remote IO as indicated on the control and instrumentation cable schedule attached to the specification and control system architecture.

The instrumentation list shall be updated by the Contractor to reflect his/her offered equipment and shall be submitted to the Engineer for approval before any process instruments are purchased. Detailed Instrumentation Data Sheets shall be produced by the Contractor and used for this purpose.

The Contractor shall be responsible for pricing any changes to the instrumentation and control design that are caused by his/her selection of revised processes and mechanical equipment.

All instrumentation equipment shall be supplied complete with mounting material and ancillary equipment required for a complete installation.

It shall be the Contractor's responsibility to supply the correct instrumentation for the applications and size the inline flow meters nominal diameters.

All instrumentation shall be suitable for installation under the corrosive conditions of the WWTW.

2.8.2 Pump/Motor protection instrumentation

- a) Pump and motor protection shall be provided as shown on the PFDs. The Contractor shall ensure all pumps and motors offered and supplied are adequately protected.
- b) Instruments for critical pump protection (safety interlocks) shall also be wired to the MCCs (by means of relays logic using certified safety relays) to ensure tripping by hardwiring, even in the absence of PLC control.
- c) Pump protection signals transmitted via the field remote IOs shall be equipped with certified safety relays.

2.8.3 Junction Boxes

- a) Instrumentation cable marshalling junction boxes shall be provided if or when required.
- b) Cables shall enter and exit the junction box from the bottom and be properly glanded to the bottom of the box, ensuring the IP rating remains intact.
- c) Cable gland plate shall be resistant to corrosion under the conditions of the WWTW.
- d) Junction boxes shall be installed in an easily accessible location on a purpose made stand or bracket which is not in the way of maintenance required to equipment in that area.

2.8.4 Installation, Inspection and Testing

- a) Instrument transmitters shall be mounted separately from sensors in a dedicated transmitter enclosure (if outdoors) and shall allow local indication as and where specified in the Instrumentation List.
- b) All sensor mounting material and brackets shall be stainless steel 316.
- c) Instrument transmitters installed indoors shall be wall mounted. Mounting material and brackets shall be galvanized steel.
- d) The outdoor transmitters with local indication shall be fitted with covers to protect the screens from solar degradation.
- e) Instrumentation installed outdoors shall have their transmitters installed in a 3CR12 IP 65 weatherproof powder coated enclosure near the point of measurement.
- f) All instrumentation that is not an integral part of mechanical equipment or part of a vendor package unit shall be supplied and installed by the Contractor together with all brackets, adaptors and connectors that may be necessary. The Contractor shall produce instrument hook-up drawings for approval by the Engineer prior to installation.
- g) The prices quoted for instrumentation shall include all process connections, adapters, brackets, utility junction boxes, glands, wires and labels as well as set-up and calibration of the instrumentation.
- h) The instruments shall be calibrated, and calibration certificates shall be supplied and submitted to the Engineer for review as well as filed in the O&M Manuals.

3 ELECTRICAL AND ELECTRONIC SCHEDULES

- a) The preliminary electrical and electronic schedules are included hereunder of this project specification.
- b) The final schedules depend on the Contractor's Design and shall be updated by the Contractor wherever applicable.

PART C: ELECTRICAL

PSC2 - PARTICULAR ELECTRICAL SPECIFICATIONS

**PSC 2.1 SPECIFICATION FOR THE SUPPLY DELIVERY AND INSTALLATION OF EMERGENCY
GENERATOR SETS AT LETHABONG WASTEWATER TREATMENT PLANT**

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PSC2.1.1SECTION 1 – GENERAL

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SPECIFICATION FOR THE SUPPLY DELIVERY AND INSTALLATION OF EMERGENCY GENERATOR SETS AT LETHABONG WWTW

PSC2.1.1 SECTION 1 – GENERAL

PSC2.1.2.1 Intent of Document

The specification is intended to cover the complete installation of the generator plant. The minimum equipment requirements are outlined, but do not cover all the details of design and construction. Such details are recognised as being the exclusive responsibility of the contractor.

In all cases where a device or part of the equipment is referred to in the singular, it is intended that such reference shall apply to as many devices as are required to complete the installation.

PSC2.1.2.2 Standards and Codes

All work and equipment shall be in accordance with the requirements of BS5514 and shall comply with the Occupational Health and Safety Act, No 85 of 1993 and current regulations of all other codes applicable to this work.

PSC2.1.2.3 Regulations

The installation shall be erected and tested in accordance with the following Acts and regulations:

- The latest issue of SANS 0142: "Code of Practice for the Wiring of Premises",
- The Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended,
- The Local Government Ordinance 1939 (Ordinance 17 of 1939) as amended and the municipal by-laws and any special requirements of the local supply authority,
- The Fire Brigade services Act 1993 Act 99 of 1987 as amended,
- The National Building Regulations and Building Standards Act 1977 (Act 103 of 1977) as amended,
- The Post Office Act 1958 (Act 44 of 1958) as amended,
- The Electricity Act 1984 (Act 41 of 1984) as amended and
- The Regulations of the local Gas Board where applicable.

PSC2.1.2.4 Scope of Work

Supply, delivery and installation of a complete

- 630kVA STANDBY RATED Open generator set specified in this document for Lethabong Wastewater Treatment Plant.

Scope of work includes all necessary work needed to ensure gen set installations are fully commissioned.

Executing all relevant civil works as it necessitates, which include trenching, making up paving subsequent to installations.

New cables labelling, legend and signage.

PSC2.1.2.5 Co-ordination

This will include for construction of all foundations, plinths, required by the Contractor for the installation of the plant and equipment. A detail of all such foundations, plinths, openings, rebates, etc. Must be supplied with his tender.

The contractor's installation rates shall include for such "first fixing: of plant as may be required and for returning at a later stage to complete the installation were necessary.

Delays due to lack of co-ordination between the Contractor's shall not form a basis for claims be the Contractor of this Contract.

PSC2.1.2.6 Test Certificates and Inspections

The following tests are to be carried out:

- (a) At the supplier's premises, before the generating sets will be delivered to site, The Engineer and Representatives of the Polokwane Local Municipality, here in after referred to as PLM (Technical) may be present during the tests to satisfy themselves that the generating sets comply with the specification and deliver the specified output. The tests must be carried out in accordance with BSS 5514, Part 2 and 3. The PLM must be timeously advised of the date for the test.
- (b) After completion of the works and before first delivery is taken, a full test will be carried out on the installation for a period of sufficient duration to determine the satisfactory working thereof. During this period the installation will be inspected and the contractor shall make good, to the satisfaction of the Representative/Agent, any defects which may arise.
- (c) The Contractor shall provide all instruments and equipment required for testing and any water, power and fuel required for the commissioning and testing of the installation at completion.
- (d) Test reports of both tests as specified under (a) and (b) are to be submitted to the Engineer and the PLM offices REPRESENTATIVE.

PSC2.1.2.7 Guarantee and Maintenance

The Contractor shall guarantee the complete plant for a period of twelfth months after the first delivery has taken place.

If during this period the plant is not in working order, or not working satisfactorily owing to faulty material, design or workmanship, the Contractor will be notified and immediate steps shall be taken by him to rectify the defects and/or replace the affected parts on site at his own expense.

The Contractor shall maintain the plant in good working condition for the full twelfth month period to the final delivery of the installation. However, should the Contractor fail to hand over the plant in good working order on the expiry of the specified twelfth months, the Contractor shall be responsible for further monthly maintenance until final delivery is taken.

During this period the contractor will undertake to arrange that the plant be inspected at least once per month by a qualified member of his staff who shall: -

- (a) Report to the Officer-in-charge, keeping the maintenance records, and enter into a log book the date of the visit, the tests carried out, and the adjustments made, and any further details that may be required.
- (b) Grease and oil moving parts, where necessary.
- (c) Check the air filter and, when necessary, clean the filter and replace filter oil.
- (d) Check the lubricating oil and top-up when necessary.
- (e) After the plant has run one oil change for the number of hours stipulated by the manufacturers, drain the sump and refill with fresh lubricating oil. The reading of the hour meter on the switchboard will be taken to establish the number of hours run by the plant.

Under this heading only the cost of the actual oil used, shall be charged as an extra on the monthly account.

- (f) Clean the lubricating oil filter and/or replace the filter element at intervals recommended by the engine manufacturer, the cost of a new filter element to be charged as an extra on the monthly account.
- (g) Check and when necessary adjust the valve settings and the fuel injection equipment.
- (h) Check the battery and top-up the electrolyte when necessary.
- (i) Test-run the plant for 0,5 hour and check the automatic starting with simulated faults on the mains, the proper working of all parts, including the electrical gear the protective devices with fault indicators, the changeover equipment and the battery charger. Make the necessary adjustments.
- (j) Report to the CCFET Office person in charge and to the Engineer on any parts that become unserviceable through fair wear and tear, or damaged by causes beyond the control of the Contractor.

The Contractor on receiving the report via the Engineer shall immediately submit a detailed quotation for the repair or replacement of such parts to the CCFET Office.

- (k) Advise the CCFET Office when it has become necessary to de-carbonise the engine and submit a quotation for this service.
- (l) Top up the water of the radiator, if applicable.
- (m) Clean the plant and its components.

PSC2.1.2.8 Materials and Workmanship

- (a) The work throughout shall be executed to the highest standards and to the entire satisfaction of the Engineer and PLM Office who shall interpret the meaning of the Contract Document and shall have the authority to reject any work and materials, which, in his judgement, are not in full accordance therewith. All condemned material and workmanship shall be replaced or rectified as directed and approved by the Engineer.
- (b) All work shall be executed in a first-class manner by qualified tradesman.
- (c) The Contractor shall warrant that the materials and workmanship shall be of the highest grade, that the equipment shall be installed in a practical and first-class manner in accordance with the best practices and ready and complete for full operation. It is specifically intended that all material or labour which is usually provided as part of such equipment as is called for and which is necessary for its proper completion and operation shall be provided without additional cost whether or not shown or described in the Contract Document.
- (d) The Contractor shall thoroughly acquaint himself with the work involved and shall verify on site all measurements necessary for proper installation work. The Contractor shall also be prepared to promptly furnish any information relating to his own work as may be necessary for the proper installation work and shall co-operate with and co-ordinate the work of others as may be applicable.
- (e) All components and their respective adjustment, which do not form part of the equipment installation work, but influence the optimum and safe operation of the equipment shall be considered to form part of, and shall be included in the Contractor's scope of works.
- (f) All control equipment and serviceable items shall be installed and positioned such that they will be accessible and maintainable.
- (g) The Contractor shall make sure that all safety regulations and measures are applied and enforced during the installation and guarantee periods to ensure the safety of the public and the CoP personnel.

PSC2.1.2.9 Imported Content

This equipment will not be subject to fluctuations in the rate of exchange.

PSC2.1.2.10 Brochures

Detailed brochures of all equipment offered shall be presented together with the tender documents.

PSC2.1.2.11 Submittals

The following information must accompany the tender documents

- (a) Full particulars, performance curves and illustrations of the equipment offered, must be submitted with the Tender.
- (b) The design of the control system to comply with the requirements for automatic starting, stopping, interlocking and isolation as specified.
- (c) Curves furnished by the engine makers, showing the output of the engine offered against the speed, for both intermittent and continuous operation as well as fuel consumption curves when the engine is used for electric generation

The successful Tenderer must, as soon as possible after receipt of the order, submit detailed drawings and wiring diagrams of the plant and the switchgear. One diagram shall be contained in a metal pouch on the side of the switchboard.

PSC2.1.2SECTION 2 – EQUIPMENT REQUIREMENTS

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PSC2.1.2.6	Construction
PSC2.1.2.7	Operation

PSC2.1.2.1 Engine**(a) General**

The engine must comply with the requirements as laid down in BS 5514 and must be of the atomised injection, compression ignition type, running at a speed not exceeding 1500 r.p.m. The engine must be amply rated for the required electrical output of the set, when running under the site conditions. The starting period for either manual or automatic switching on until the taking over by the generating set, in one step, of a load equal to the specified site electrical output, shall not exceed 15 seconds. This must be guaranteed by the Tenderer.

Turbo-charged engines will only be accepted if the Tenderer submits a written guarantee that the engine can deliver full load within the specified starting period.

(b) Rating

The set shall be capable of delivering the specified output continuously under the site conditions, without overheating. The engine shall be capable of delivering an output of 110 % of the specified output for one hour in any period of 12 hours consecutive running in accordance with BS 5514.

(c) De-Rating

The engine must be de-rated for the site conditions as set out in the Technical Specification, Section 3 of this document.

The de-rating of the engine for site conditions shall be strictly in accordance with BS 5514 of 1977 as amended to date. Any other methods of de-rating must have the approval of the Engineer and must be motivated in detail. Such de-rating must be guaranteed in writing and proved by the successful Tenderer at the site test.

(d) Starting and Stopping

The engine shall be fitted with an electric starter motor and be easily started from cold, without the use of any special ignition devices under summer as well as winter conditions.

Tenderers must state what arrangements are provided to ensure easy starting in cold weather. Full details of this equipment must be submitted. In the case of water cooled engines, any electrical heaters shall be thermostatically controlled. The electrical circuit for such heaters shall be taken from the control panel, and must be protected by a suitable circuit breaker.

(e) Starter Battery

The set must be supplied by a fully charged lead-acid type battery, complete with necessary electrolyte. The battery must have sufficient capacity to provide the starting torque stipulated by the engine makers. The battery capacity shall not be less than 120 Ah and shall be capable of providing three consecutive start attempts from cold and thereafter a fourth attempt under manual control of not less than 20 seconds duration each. The battery must be of the heavy duty "low maintenance" type, housed in a suitable battery box made of 3CR12 steel and having a substantive rubber or wooden platform to seat. Cables to be terminated using appropriate fasteners with any exposed ends of the terminal insulated using heat shrink insulation. The use of ordinary insulation tape will not be accepted.

In addition it shall be the Tenderers responsibility to provide a First Aid Kit. The kit shall be mounted at a safe, easily accessible and clearly visible point which is identified on site. Kit is to be supplied complete with Signage.

(f) Cooling

The engine may be either of the air or water cooled type. In the case of water-cooling, a built-on heavy duty, tropical type pressurised radiator must be fitted. Only stand-by sets that are water cooled shall have electric heaters.

For either method of cooling, protection must be provided against running at excessive temperatures. The operation of this protective device must give a visual and audible indication on the switchboard. Water-cooled engines shall in addition be fitted with a low water cut-out switch, installed in the radiator, to switch the set off in the event of a loss of coolant. The protection shall operate in the same way as the other cut-outs (e.g. low oil pressure). All air ducts for the cooling of the engine are to be allowed for. The air shall be supplied from the cooling fan cowling/radiator face.

(g) Lubrication

Lubrication of the main bearings and other important moving parts shall be by forced feed system. An automatic low oil pressure cut-out must be fitted, operating the stop solenoid on the engine and giving a visible and audible indication on the switchboard.

(h) Fuel Pump

The fuel injection equipment is suitable for operation with the commercial brands of diesel fuel normally available in South Africa.

(i) Fuel Tank

The tank shall have sufficient capacity for standby sets to run the engine on full load for a period of 12 hours.

The tank shall be fitted with a suitable filter, a full height gauge glass, "low fuel level" alarm, giving an audible and visible signal on the switchboard as well as a low-low fuel level cut-out.

(j) Governor

The speed of the engine shall be controlled by a governor in accordance with class A2 of BS 5514 of 1977 if not otherwise specified in the Technical Specification.

The permanent speed variation between no load and full load shall not exceed 4,5% of the normal engine speed and the temporary speed variation shall not exceed 10% External facilities must be provided on the engine, to adjust the normal speed setting by $\pm 5\%$ at all loads zero and rated load.

(k) Flywheel

A suitable flywheel must be fitted, so that lights fed from the set will be free from any visible flicker.

The cyclic irregularity of the set must be within the limit laid down in BS 5514 of 1977.

(l) Exhaust Silencer

It is essential to keep the noise level as low as possible. An effective exhaust silencing system of the residential type must be provided.

The exhaust pipe shall be installed in such a way that the expelled exhaust fumes will not cause discomfort to the public. The exhaust pipe must be flexibly connected to the engine to take up vibrations transmitted from the engine, which may cause breakage.

(m) Accessories

The engine must be supplied complete with all accessories, air and oil filters, 3 instruction manuals, spare parts lists, the first fill of all lubricating oils, fuel, etc.

PSC2.1.2.2 Alternator

(a) General

The alternator shall be of the self excited brush less type, with enclosed ventilated drip proof housing and must be capable of supplying the specified output continuously with a temperature rise not exceeding the limits laid down in BS 5000 for rotor and stator windings.

The alternator shall be capable of delivering an output of 110% of the specified output, for one hour in any period of 12 hours consecutive running.

Both windings must be fully impregnated for tropical climate and must have an oil resisting finishing varnish.

(b) Regulation

The alternator must preferably be self-regulated without the utilisation of solid state elements. The inherent voltage regulation must not exceed plus or minus 5% of the nominal voltage specified, at all loads with the power factor between unity and 0,8 lagging and within the driving speed variations of 4,5% between no-load and full load.

(c) Performance

The excitation system shall be designed to promote rapid voltage recovery following the sudden application of the load. The voltage shall recover to within 5% of the steady state within 300 mili-seconds following the application of full load and the transient voltage dip shall not exceed 18%.

(d) Coupling

The engine and alternator must be directly coupled by means of a high quality flexible coupling, equal and similar to the "HOLSET" type.

PSC2.1.2.3 Switchboard

(a) General

A switchboard must be supplied and installed to incorporate the equipment for the control and protection of the generating set and battery charging.

The switchboard must conform to the specification as set out in the following paragraphs.

(b) Construction

The switchboard shall be integrated in generator unit.

All equipment, connections and terminals shall be easily accessible from the front.

All pushbuttons, pilot lights, control switches, instrument and control fuses, shall be mounted on hinged panels with the control wires in flexible looms.

Suitably rated terminals must be provided for all main circuits and the control and protection circuits. Where cable lugs are used, these shall be crimped onto the cable strands. Screw terminals shall be of the type to prevent spreading of cable strands. All terminals shall be clearly marked.

The automatic control and protection equipment shall mainly be the "solid state" type. After mounting the equipment on the panel, the rear of this panel shall be sealed with epoxy-resin. However, other proven control systems may also be considered, but must be described in detail.

All equipment on the switchboard, such as contactors, isolators, busbars, etc., shall have ample current carrying capacity to handle at least 110% of the alternator full load current.

(c) Protection and Alarm Devices

All switchboards shall be equipped with protection and alarm devices as described below.

A circuit breaker and an adjustable current limiting protection relay must be installed for protection of the alternator. The protection relay shall be of the type with inverse time characteristics. The relay shall cause contactor to isolate the alternator and stop the engine.

Protection transducers or devices must be provided for

- i) overload,
- ii) High engine oil and water temperature alarm and engine cut out.
- iii) Low lubricating oil pressure alarm and engine cut out respectively.
- iv) Over speed or Over frequency.
- v) start-failure,
- vi) Low water level engine cut out.
- vii) Short Circuit ,
- viii) Voltage and Current Imbalance

Individual relays with reset pushed are required, to give a visible signal , alarm or stop the engine when any of the protective devices operate. In the case of manual operation of standby sets, it shall not be possible to restart the engine.

The indicators and re-set pushes must be marked.

“OVERLOAD”

“TEMPERATURE HIGH”

“OIL PRESSURE LOW”

“OVER-SPEED”

“START FAILURE”

“LOW WATER LEVEL”

In addition two relays with reset pushes must be fitted giving and audible and visible signal when:

- i. The fuel level in the service tank is low. The reset push of this relay must be marked “FUEL LOW”

In addition, a low-low level sensor must be provided. At this level the engine must stop to prevent air entering the fuel system.

- ii. The battery charger failed. The reset push of this relay must be marked “CHARGER FAIL”

This is also applicable to the engine driven generator/alternator.

All relays must operate an alarm hooter. A pushbutton must be installed in the hooter circuit to stop the audible signal, but the fault indicating light on the control panel must remain lit until the fault has been rectified.

An on/off switch is not acceptable. After the hooter has been stopped, it must be re-set automatically, ready for a further alarm.

The hooter must be of the continuous duty and low consumption type. Both hooter and protection circuits must operate from the battery.

Potential free contacts from the alarm relay must be brought down to terminals for remote indication of alarm conditions.

A test pushbutton must be provided to test all indicators lamps.

(d) Manual Starting

The unit shall be equipped with two pushbuttons marked “START” and “STOP” for manual starting and stopping of the set.

(e) Battery Charging Equipment

Each switchboard shall be equipped with battery charging equipment.

The charger shall operate automatically in accordance with the state of the battery and shall generally consist of an air-cooled transformer, a full wave solid state rectifier, and the necessary automatic control equipment of the constant voltage system.

The charger must be fed from the mains. An engine driven alternator must be also a provided for charging the battery while the set is operational. Failure of this alternator must also activate the battery charger failure circuit.

(f) Instruments

The following described instruments are Analogue and act as guides of what parameters are to be indicated. An Electronic Controller which shall indicate the same parameters Digitally is preferred for reduction of wiring. Were the Controller does not provide full functionality, analogue instruments shall be added to fulfil such functions.

The generator set shall have a switchboard equipped as follows:

- i. One flush square dial voltmeter, reading the alternator voltage, scaled as follows:
 - 0-300V for single phase generators.
 - 0-500V for three phase generator. In this case a six position and off selector switch must be installed for reading all phase and phase to neutral voltages.
- ii. A flush square dial combination maximum demand and instantaneous ampere meter for each phase, with resettable pointer suitably scaled 20% higher than the alternator rating. A red arc stripe above scale markings from 0-20A and a red radial line through the scale at full-load current shall be provided. These instruments shall be supplied complete with the necessary current transformer.
- iii. One flush square dial vibrating type frequency meter, indicating the alternator frequency.
- iv. A six digit running hour meter with digital counter, reading the number of hours the plant has been operating. The smallest figure on this meter must read 1/10 hour.
- v. Fuses or m.c.b.'s for the potential voltage circuits of the meters.
- vi. One flush square dial ampere meter suitably scaled for the battery charging current.
- vii. One flush square dial voltmeter with a spring-loaded pushbutton or switch for the battery voltage.

(g) Marking

All labels, markings or instructions on the switchgear shall be in both official languages. **Labelling of equipment shall be as specified in the SANS 0142 standard 'Code of Practice for the Wiring of Premises'.**

(h) Earthing

An earth bar must be fitted in the switchboard, to which all non-current carrying metal parts shall be bonded.

The neutral point of the alternator must be solidly connected this bar by means of a removable link labelled "EARTH" "AARD". Suitable terminals must be provided on the earth bar for connection of up to three earth conductors, which will be supplied and installed by others.

(i) Operation Selector Switch

As a guide for functionality a four-position selector switch must be provided on the switchboard marked "AUTO", "MANUAL", "TEST" and "OFF" - "AUTO", "HANDBEHEER" "TOETS" and "AF".

As preference the Controller mentioned in item 3.6 on Instruments above shall incorporate the above-mentioned functionality.

With the selector on "AUTO", the set shall automatically start and stop, according to the mains supply being available or not.

With the selector on "TEST", it shall only be possible to start and stop the set with the pushbuttons, but the running set shall not be switched to the load.

With the selector on "MANUAL", the set must take the load when started with the pushbutton, but it must not be possible to switch the set on to the mains, or the mains onto the running set.

With the selector on "OFF", the set shall be completely disconnected from the automatic controls, for cleaning and maintenance of the engine.

(j) Automatic Change-over System

A fully automatic change-over system must be provided to isolate the mains supply and connect the standby set to the outgoing feeder in case of a mains failure and reverse this procedure on return of the mains.

(k) By-pass Switch and Main Isolator

The switchboard shall be equipped with an on-load isolator to isolate the mains and a manually operated on-load by-pass switch, which shall either connect the incoming mains to the automatic control gear or directly to the outgoing feeder. In the latter position the automatic control gear, including the main contractors, shall be isolated for maintenance purposes. It shall not be possible to start the engine except with the selector switch in the "TEST" position.

It is required that this by-pass switch and mains isolator be mounted away from the automatic control gear, in a separate compartment either on the side or in the lower portion of the switchboard cubicle, and that the switches operated from the front of the compartment.

(l) Start Delay

Starting shall be automatic in event of a mains failure. A 0-15 second adjustable start delay timer shall be provided to prevent start-up on power trips or very short interruptions.

(m) Stop Delay

A stop delay with timer is required for the set, to keep the set on load for an adjustable period of one to sixty seconds after the return of the mains supply, before changing back to the supply. An additional timer shall keep the set running for a further adjustable cooling period of 5 to 10 minutes at no-load before stopping.

PSC2.1.2.4 Installation

Except for the supply of the incoming mains cable and outgoing feeder cables or bus bars were specified, the Tenderer must include for the complete installation and wiring of the plant in running order, including the connection of the incoming and outgoing feeder cables or bus bars were specified.

The connecting of the cable or bus bars and control cabling to the generator and the control terminals in the LV board remains the responsibility of the Tenderer.

PSC2.1.2.5 Warning Notices

Notices, in both official languages, must be installed in the plant rooms.

The contents of these notices are summarised below.

- (a) Unauthorised entry prohibited. (Must be posted outside at the entrance door or near at a clearly visible point)
- (b) Unauthorised handling of equipment prohibited. (Must be posted on a clearly visible and accessible point)
- (c) Procedure in case of electric shock. (Must be posted on a clearly visible and easily accessible point). In addition it shall be the Tenderers responsibility to supply and install a First Aid Kit .The kit

shall be mounted at a safe, easily accessible and clearly visible point which shall identified on site. Kit is to be supplied complete with Signage.

- (d) Procedure in case of fire. In addition, the Tenderer shall also supply and install a Fire Extinguisher complete with signage. The unit shall be mounted at an easily accessible and clearly visible safe point. The exact point is to be identified on site.

The successful Tenderer must consult the Occupational Health and Safety Act 83 of 1993 and get approval of the wording from the Department's representative, prior to ordering the notices.

Lettering must be black on a yellow background or red on a white background.

The motive shall be made of a non-corrodible and non-deteriorating material, preferable plastic or equivalent material that is weather resistant especially the high temperatures and water and must read as follows:

DANGER: This engine will start without notice. Turn selector switch on control board to "OFF" before working on the plant.

PSC2.1.2.6 Construction

The engine and alternator of the set shall be built together on a common frame, which must be mounted on a skid base on anti-vibration mountings. The set must be placed direct on the plinth. A drip tray must be fitted under the engine. The tray must be large enough to catch a drip from any part of the engine.

The frame must be of the 'DUPLEX' type or Similar.

PSC2.1.2.7 Operation

The set is required to supply the lighting and power requirements in the case of a mains power failure.

The set shall be fully automatic i.e. it shall start when any one phase of the main supply fails or get switched and shall shut down when the normal supply is re-established. In addition, it shall be possible to manually start and stop the set by means of pushbuttons on the switchboard.

The automatic control shall make provision for three consecutive starting attempts. Thereafter the set must be switched off, and the start failure relay on the switchboard must give a visible and audible indication of the fault.

To prevent the alternator being electrically connected to the mains supply when the mains supply is on and vice versa, a safe and fail proof system of suitably interlocked contactors shall be supplied and fitted to the changeover switchboard.

PSC 2.1.3 SECTION 3 – TECHNICAL SPECIFICATION

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PSC2.1.3.5	Power Transmission
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PSC2.1.3.14	Inform

PSC2.1.3

SECTION 3 – TECHNICAL SPECIFICATION

PSC2.1.3.1 General

Supply, deliver, install, commission, test and maintain emergency generating sets at Lethabong Wastewater Treatment Plant.

This installation must comply fully with all the sections and drawings of this document. This technical specification is supplementary to the Equipment Requirements, Section 2, and must be read together where they are at variance the Technical Specification shall apply.

The sets must be installed as directed by the Engineer. Clearance thereof in all relevant dimensions shall to be advised by the engineer prior to installation.

PSC2.1.3.2 Site Information and Conditions

a) Site Conditions

The following site conditions will be applicable and equipment shall be suitably rated to develop their assigned rating and duty at these conditions.

- | | | |
|----|---|---------|
| 1) | a) Height above sea level | : 1060m |
| 2) | b) Maximum ambient temperature | : 40 °C |
| 3) | c) Maximum ambient humidity at lowest temperature | : 100% |

PSC2.1.3.3 Output and Voltage

After the de-rating factors for the engine and generator due to site conditions have been taken into account, each set must have a site output and voltage as follows: -

No load voltage	:	400/230 Volt
Prime Rating	:	630 kVA
Power at 0,8 power factor	:	505 kW
Frequency	:	50Hz
Fault Level	:	15kA

The generating sets are required to feed the following electrical load:

		Load (kW)	Power Factor
• LED lighting		various	0.8-1
• Fluorescent lighting	various	0.8-1	
• Computers, Server equipment		various	0.8-1
• Induction motor driven pumps		various	0.8-1
• Various communication equipment	various	0.8-1	
• UPS		various	0.8-1

PSC2.1.3.4 Switchboard/Control Panel Unit

All switch- and control gear shall be rated for a fault current level of 15kA.

The switchboard/control panel unit shall be integrated in unit and shall be a solid-state unit.

The Changeover kiosk shall be a free-standing unit adequate for indoor applications.

PSC2.1.3.5 Power Transmission

The contractor will be responsible for all electrical cable connections associated with the complete generating sets installation. Reference shall be made to the project specific cable schedule for cable sizes.

PSC2.1.3.6 Engine

Recommended oil types must be indicated on the engine, or base frames, by means of suitable labels.

All engine instruments shall have clear markings on the faceplates, indicating the normal operating zone(s), maximum and minimum allowable values/limits and danger zone(s).

PSC2.1.3.7 Alternator

The Alternator shall be of the low harmonic type in compliance with BS5000 of 1977.

PSC2.1.3.8 Load Acceptance

The generator set shall be capable of accepting 75% of the specified site electrical output 10 seconds after the starter motor is energised and the remaining 25%, 5 seconds thereafter, i.e. 100% load acceptance shall not exceed 15 seconds.

PSC2.1.3.9 Mounting and Enclosure

The unit must each be installed in the existing generator rooms on each site. As a consequence, each of the generator sets must be of the **INDOOR TYPE**. Noise level measured at a radius of 7m from each set must be no more than 70dBA. In view of this the muffler or silencer of each of the generator sets must be housed in a separate sound proof compartment to reduce noise, only the exhaust pipe shall protrude outside the compartment .

PSC2.1.3.10 Alarms

The successful Tenderer must pay particular attention to the requirements of the alarms as described in the Equipment Requirements, Section 2.

A hooter shall be integrated in unit and shall consist of an electronic unit similar and equal to a "Klaxon" - type SY2/725 hooter with a continuously rated output and 110 db at a distance of 2 metres, and shall be IP55 weatherproof rated.

The warning light consisting of a 40W flashing red light shall also be available.

The hooter and light shall be switched on or off simultaneously after initiation or cancellation of an alarm condition. The supply and installation of the wiring between the control board and the alarm unit forms part of this contract.

The successful Tenderer must ensure that the hooter control circuit resets automatically after cancellation due to a low fuel condition or battery charger failure, but the visible fault indication must remain, i.e. should the operator continue to run the set, the hooter must sound, should any other condition develop.

PSC2.1.3.11 Remote Control Generator Switch

A remote-control switch will not be necessary.

PSC2.1.3.12 Fuel Drip Tray

A drip tray approximately 100mm deep shall be mounted below the fuel tank and must be large enough to collect any fuel that drips from the tank accessories. The drip tray shall be manufactured from black mild steel. The thickness of the drip tray sheet steel shall not be less than 2mm.

PSC2.1.3.13 Completion Time

The Generator Sets are required to be commissioned as per the date proposed in contract document.

PSC2.1.3.14 Inform

The successful Tenderer shall inform the Engineer when the sets are ready for installation.

PSC 2.1.4 SECTION 4 – SCHEDULES OF TECHNICAL INFORMATION

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RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

PSC2.1.4

SECTION 4 – SCHEDULES OF TECHNICAL INFORMATION

NOTE: TENDERERS TO COMPLETE THIS SECTION FOR EACH GENERATOR SET.

1. Engine

NO	ITEM	REMARKS
	Manufacturer's Name	
	Country of Origin	
	Manufacturer's model No. and year of manufacture	
	Continuous sea level rating after allowing for ancillary equipment : a) In b.h.p. b) In kW	
	Percentage de-rating for site conditions, in accordance with BS 551.4 a) For altitude b) For temperature c) For humidity d) Total de-rating	
	Net output on site in kW	
	Nominal speed in r.p.m.	
	Number of cylinders	
	Strokes per working cycle	
	Stroke in mm	
	Cylinder bore in mm	
	Swept volume in cm ³	
	Mean piston speed in m/min	
	Compression ratio	
	Cyclic irregularity	
	Fuel consumption of the complete generating set on site in l/h of alternator output at : a) Full load (100%) b) ¾ load (75%) c) ½ load (50%)	

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Part C4: Site Information

Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

NO	ITEM	REMARKS
	NOTE : A tolerance of 5% shall be allowed above the stated value of fuel consumption.	
	Make of fuel injection system.	
	Capacity of fuel tank in litres	
	Is gauge glass fitted to tank?	
	Is electric pump for filling the fuel tank included?	
	Method of starting	
	Voltage of starting system	

	Method of cooling	
	Type of radiator if water-cooled	
	Type of heater for warming cylinder heads	
	Capacity of heater in kW	
	Method of protection against high temperature	
	Method of protection against low oil pressure	
	Type of governor	
	Speed variation in % a. Temporary b. Permanent	
	Minimum time required for as assumption of full load in seconds	
	Recommended interval in running hours for: a. Lubricating oil change b. Oil filter element change c. Decarbonising	
	Type of base	
	Can plant be placed on solid concrete floor?	
	Are all accessories and ducts included?	

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Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

BID NO: RLM/OMM/0091/2022/23

APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

NO	ITEM	REMARKS
	Is engine naturally aspirated?	
	Are performance curves attached?	
	Diameter of exhaust pipe	
	Noise level in plant room in dBA	N/A
	Noise level at tail of exhaust pipe in dBA	
	BMEP (4 stroke) at continuous rating (kPa)	
	% Load acceptance to BS 5514, Part 4, with 10% transient speed drop	

2. Alternator

NO	ITEM	REMARKS
	Maker's name and model no.	
	Country of Origin and year of manufacture	
	Type of enclosure	
	Nominal speed in r.p.m.	
	Number of bearings	
	Terminal voltage	

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Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



RUSTENBURG LOCAL MUNICIPALITY

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APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

NO	ITEM	REMARKS
	Sea level rating kVA at 0,8 power factor	
	De-rating for site conditions	
	Input required in kW	

	Method of excitation	
	Efficiency at 0,8 power factor and: a) Full load b) $\frac{3}{4}$ load c) $\frac{1}{2}$ load	
	Maximum permanent voltage variation in %	
	Transient voltage dip on full load	
	Voltage recovery on full load application in milli-seconds	
	Is alternator brushless?	
	Class of insulation of windings	
	Is alternator tropicalised?	
	Symmetrical short circuit current at terminals n Ampere	
	Type of Coupling	

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Employer

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Contractor

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3. Switchboard

NO	ITEM	REMARKS
	Maker's Name	
	Country of Origin	
	Is board floor mounted?	
	Finish of board	
	Make of volt, amp, and frequency meters	
	Dial size of meters in mm	
	Scale range of voltmeter	
	Scale range of ammeters	
	Ratio of current transformers	
	Make of hour meter	
	Range of cyclometer counter	
	Smallest unit shown on counter (Item 11)	
	Make of circuit breaker	
	Type of circuit breaker	
	Rating of circuit breaker in Amp and fault level in kA	
	Setting range of overload trips	
	Setting range of instantaneous trips	
	Make of change-over equipment	
	Make of voltage relay	
	Is control and protection equipment mounted on a small removable panel?	
	Type of control equipment	

	Make of mains isolator	
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NO	ITEM	REMARKS
	Type of indicators for protective devices	
	Make of rectifier	
	Type of rectifier	
	Is battery charging	
	Are volt- and ammeters provided for charging circuit?	
	Is the alarm hooter of the continuous duty type?	
	Rating in Amps of: a. Change-over equipment b. Mains on load isolator c. By-pass switch d. Circuit breaker to outgoing feed	
	Is manufacture of switchboard/control panel to be sub-let?	
	If yes, state name and address of specialist manufacturer	

4. Battery

NO	ITEM	REMARKS
	Maker's Name	
	Country of Origin	
	Type of battery	
	Voltage of battery	
	Number of cells	
	Capacity in cold crank amp	

5. Dimensions

NO	ITEM	REMARKS
	Overall dimensions of set in mm	
	Overall mass	

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	Is the generator room adequate for the installation of the set	
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6. Deviation from the Specification as an Alternative (State Briefly)

NO	DESCRIPTION

7. Spare Parts and Maintenance Facilities

NO	ITEM	REMARKS
1	Approximate value of spares carried in stock for this particular diesel engine and alternator	
2	Where are these spares held in stock	
3	What facilities exist for the servicing of the equipment offered	
4	Where are these facilities available	

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PSC2.2 LOW VOLTAGE BOARD AND MCC SPECIFICATIONS

LETHABONG WASTEWATER TREATMENT WORKS REFURBISHMENT AND UPGRADE		
MAIN LOW VOLTAGE BOARD SPECIFICATION		
- Panel shall be manufactured of 3Cr12 2.2mm thick material and shall be powder coated in electric orange colour. All labels to be engraved on traffolyte material. - Detailed shop drawing must be submitted to the electrical engineer for approval before manufacture commences. - Notwithstanding the above the panel/board length, width and depth shall be suited to the available space in the panel room. Contractor to be responsible of satisfying him/her self that the panel will fit in the available space and that all cable gland plates are punched to allow connection of cables.		
Compartment	Power Circuitry	Instruments/Control Circuitry
1	- 800A/25kA 400V 50Hz Triple Pole electrical motor protection Mains incomer circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - Surge Arrestors to be installed - Circuit breaker characteristics to be graded with the rest of the power system protection devices downstream.	- Digital kWh/kVA, cos phi, supply frequency, voltage and current measuring instrument complete with all current transformers and all necessary accessories to give fully commissioned electrical parameters reading. - Digital instrument to allow voltage and current display for all 3 phases. - All metering current transformers and wiring cables to be supplied and wired by Manufacturer.
2	- 800A/25kA 400V 50Hz Triple Pole electrical motor protection Generator Supply isolator. - Surge Arrestors to be installed - Circuit breaker characteristics to be graded with the rest of the power system protection devices downstream.	
3	Plugs and lights distribution with - 1 x 63A Single Pole Main Circuit Breaker. - 2 x 10A Single Pole Circuit Breaker. - 1 x 5A Single Pole Circuit Breaker. - 1 x 5A Single Pole By Pass Circuit Breaker - 3 x 20A Single Pole Circuit Breakers - 1 x 63A Earth leakage circuit breaker. - 1 x 20A Single Pole Contactor.	
4	Main Building distribution board with 40A/25kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication New	
5	Inlet Works MCC supply with	

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	40A/25kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
6	New Module 2 MCC supply with 200A/25kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
7	Module 3 MCC supply with 500A/25kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
8	Emergency overflow pump station supply with 40A/25kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
9	Spare with 100A/25kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
10	Spare with 100A/25kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
11	High Mast supply with 40A/25kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
12	High Mast supply with 40A/25kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
13	DC supply for PLC/SCADA circuitry	
14	PLC/SCADA to be suitably sized to accommodate PLC/SCADA equipment including interposing relays among others. Contractor to verify requirements before manufacturer of board commences.	

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LETHABONG WASTEWATER TREATMENT WORKS REFURBISHMENT AND UPGRADE		
NEW INLET WORKS STATION MOTOR CONTROL CENTRE SPECIFICATION		
- IP65 Motor Control Centre shall be manufactured of 3Cr12 2.2mm thick material and shall be powder coated in electric orange colour. All labels to be engraved on traffolyte material. - Detailed shop drawing must be submitted to the electrical engineer for approval before manufacture commences. - Notwithstanding the above the panel/board length, width and depth shall be suited to the available space in the panel room. Contractor to be responsible of satisfying him/her self that the panel will fit in the available space and that all cable gland plates are punched to allow connection of cables.		
Compartment	Power Circuitry	Instruments/Control Circuitry
1	- 40A/10kA 400V 50Hz Triple Pole mains incomer isolator with mechanical latching mechanism for breaker trip/off/on indication.	- Digital kWh/kVA, cos phi, supply frequency, voltage and current measuring instrument complete with all current transformers and all necessary accessories to give fully commissioned electrical parameters reading.

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Contractor

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		- Digital instrument to allow voltage and current display for all 3 phases. - All metering current transformers and wiring cables to be supplied and wired by Manufacturer.
2	Plugs and lights distribution with - 1 x 63A Single Pole Main Circuit Breaker. - 2 x 10A Single Pole Circuit Breaker. - 1 x 5A Single Pole Circuit Breaker. - 1 x 5A Single Pole By Pass Circuit Breaker - 3 x 20A Single Pole Circuit Breakers - 1 x 63A Earth leakage circuit breaker. - 1 x 20A Single Pole Contactor.	
3	Mechanical Screen panel with - 20A/10kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 5.5 kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication on panel. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel. - Local start/stop/emergency stop with selector switch for local/remote operation (wiring to allow remote/field start/stop/emergency stop to be provided). LED indication for status to be provided.
4	Screenings Washer panel with - 20A/10kA Triple pole circuit breaker with mechanical latching mechanism	- Circuit breaker to also have auxiliary contacts for circuit breaker

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	for breaker trip/off/on indication. - 5.5 kW variable speed drive.	trip/on/off indication on panel. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel. - Local start/stop/emergency stop with selector switch for local/remote operation (wiring to allow remote/field start/stop/emergency stop to be provided). LED indication for status to be provided.
5	Degritter Paddle Mixer panel with - 20A/10kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 5.5 kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication on panel. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel. - Local start/stop/emergency stop with selector switch for

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Contractor

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		local/remote operation (wiring to allow remote/field start/stop/emergency stop to be provided). LED indication for status to be provided.
6	Grit Classifier panel with - 10A/10kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 2.2 kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication on panel. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel. - Local start/stop/emergency stop with selector switch for local/remote operation (wiring to allow remote/field start/stop/emergency stop to be provided). LED indication for status to be provided.
7	Lime Dosing pump 2 panel with - 10A/6kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 2.2kW variable speed drive	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for

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		drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
8	Flow measuring panel with 20A Single pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
9	High Mast supply with 40A/10kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
10	Existing Staff Building Distribution Board Supply panel with 60A Single pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
11	DC supply for PLC/SCADA circuitry	
12	PLC/SCADA to be suitable sized to accommodate PLC/SCADA equipment including interposing relays among others. Contractor to verify requirements before manufacturer of board commences.	

LETHABONG WASTEWATER TREATMENT WORKS REFURBISHMENT AND UPGRADE		
NEW MODULE 2 MOTOR CONTROL CENTRE SPECIFICATION		
- IP65 Motor Control Centre shall be manufactured of 3Cr12 2.2mm thick material and shall be powder coated in electric orange colour. All labels to be engraved on traffolyte material. - Detailed shop drawing must be submitted to the electrical engineer for approval before manufacture commences. - Notwithstanding the above the panel/board length, width and depth shall be suited to the available space in the panel room. Contractor to be responsible of satisfying him/her self that the panel will fit in the available space and that all cable gland plates are punched to allow connection of cables.		
Compartment	Power Circuitry	Instruments/Control Circuitry
1	- 200A/15kA 400V 50Hz Triple Pole mains incomer isolator with mechanical latching mechanism for breaker trip/off/on indication.	
2	Plugs and lights distribution with - 1 x 63A Single Pole Main Circuit Breaker.	

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	- 2 x 10A Single Pole Circuit Breaker. - 1 x 5A Single Pole Circuit Breaker. - 1 x 5A Single Pole By Pass Circuit Breaker - 3 x 20A Single Pole Circuit Breakers - 1 x 63A Earth leakage circuit breaker. - 1 x 20A Single Pole Contactor.	
3	Recycle pump 1 panel with - 60A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 15kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
4	Recycle pump 2 panel with - 60A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 15kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
5	Recycle pump 3 panel with - 60A/15kA Triple pole circuit breaker with	- Circuit breaker to also have auxiliary contacts for

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	- mechanical latching mechanism for breaker trip/off/on indication. 15kW variable speed drive.	- circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
6	Anoxic Reactor Mixer Pump 1 panel with 30A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. 5.5kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
7	Anoxic Reactor Mixer Pump 2 panel with 30A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. 5.5kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration

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		with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
8	Flow measuring panel with 20A Single pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
9	Ferrichloride Dosing Pump panel with - 10A/15kA Single pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 1.1 kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
10	High Mast supply with 40A/10kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
11	DC supply for PLC/SCADA circuitry	
12	PLC/SCADA to be suitable sized to accommodate PLC/SCADA equipment including interposing relays among others. Contractor to verify requirements before manufacturer of board commences.	

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Contractor

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LETHABONG WASTEWATER TREATMENT WORKS REFURBISHMENT AND UPGRADE		
MODULE 3 MOTOR CONTROL CENTRE SPECIFICATION		
- IP65 Motor Control Centre shall be manufactured of 3Cr12 2.2mm thick material and shall be powder coated in electric orange colour. All labels to be engraved on traffolyte material. - Detailed shop drawing must be submitted to the electrical engineer for approval before manufacture commences. - Notwithstanding the above the panel/board length, width and depth shall be suited to the available space in the panel room. Contractor to be responsible of satisfying him/her self that the panel will fit in the available space and that all cable gland plates are punched to allow connection of cables.		
Compartment	Power Circuitry	Instruments/Control Circuitry
1	- 600A/15kA 400V 50Hz Triple Pole mains incomer isolator with mechanical latching mechanism for breaker trip/off/on indication.	
2	Plugs and lights distribution with - 1 x 63A Single Pole Main Circuit Breaker. - 2 x 10A Single Pole Circuit Breaker. - 1 x 5A Single Pole Circuit Breaker. - 1 x 5A Single Pole By Pass Circuit Breaker - 3 x 20A Single Pole Circuit Breakers - 1 x 63A Earth leakage circuit breaker. - 1 x 20A Single Pole Contactor.	
3	Anaerobic Reactor Mixer panel with - 30A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 5.5kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
4	Anoxic Reactor Mixer panel with - 30A/15kA Triple pole circuit breaker with	- Circuit breaker to also have auxiliary contacts for

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	- mechanical latching mechanism for breaker trip/off/on indication. 10kW variable speed drive.	- circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
5	Aerobic Reactor Aerator panel 1 with 60A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. 22kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
6	Aerobic Reactor Aerator panel 2 with 60A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. 22kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration

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Contractor

Witness 1

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		- with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
7	Aerobic Reactor Aerator panel 3 with - 60A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 22kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
8	Aerobic Reactor Aerator panel 4 with - 60A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 22kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
9	Aerobic Reactor Aerator panel 5 with - 60A/15kA Triple pole circuit breaker with	- Circuit breaker to also have auxiliary contacts for

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Witness 1

Witness 2

Contractor

Witness 1

Witness 2



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	- mechanical latching mechanism for breaker trip/off/on indication. 22kW variable speed drive.	- circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
10	Aerobic Reactor Aerator panel 6 with 60A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. 22kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
11	Axial Lift Pump 1 panel with 30A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. 5kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration

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Employer

Witness 1

Witness 2

Contractor

Witness 1

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		with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
12	Axial Lift Pump 2 panel with - 30A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 5kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
13	Ferrichloride Dosing Pump panel with - 10A/15kA Single pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 1.1 kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
13	RAS Pump 1 panel with - 20A/15kA Triple pole circuit breaker with	- Circuit breaker to also have auxiliary contacts for

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	- mechanical latching mechanism for breaker trip/off/on indication. - 4kW variable speed drive.	- circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
14	RAS Pump 2 panel with - 20A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 4kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
15	RAS Pump 3 panel with - 20A/15kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 4kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration

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		with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
16	Clarifier Bridge Motor 1 panel with - 20A/6kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 1.1kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
17	Clarifier Bridge Motor 2 panel with - 20A/6kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication. - 1.1kW variable speed drive.	- Circuit breaker to also have auxiliary contacts for circuit breaker trip/on/off indication. Interposing relays to be included for integration with PLC/SCADA inputs. - VSD auxiliary digital outputs for drive run/stop healthy/trip integration with PLC/SCADA system. - VSD 4-20mA analogue output for integration with the PLC/SCADA system. - VSD run/stop healthy/trip LED indication on panel.
18	Flow measuring panel with 20A Single pole circuit breaker with mechanical latching mechanism for	

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	breaker trip/off/on indication.	
19	High Mast supply with 40A/10kA Triple pole circuit breaker with mechanical latching mechanism for breaker trip/off/on indication.	
20	DC supply for PLC/SCADA circuitry	
21	PLC/SCADA to be suitable sized to accommodate PLC/SCADA equipment including interposing relays among others. Contractor to verify requirements before manufacturer of board commences.	

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CONTRACT PART C4: SITE INFORMATION

- C4.1: Location of the Works**
- C4.2: OHS Specifications**
- C4.3: Site Administration Forms**
- C4.4: Geological Investigations**
- C4.5: Climatic Conditions**

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C4.1 Location of the Works

Lethabong is located in the centre of the region Rustenburg Ward 27 and Ward 28 and is situated approximately 35km northeast of Rustenburg CBD. It can be located on coordinates 25° 26' 47.14" S and 27° 30' 02.04" E.

Figure a-1 Location of Project Site



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C4.2 OHS Specifications



OCCUPATIONAL HEALTH AND SAFETY SPECIFICATION

Compiled for

RUSTENBURG LOCAL MUNICIPALITY

For

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CIVIL CONSTRUCTION &

BUILDING PROJECTS

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Annex: Standard Conditions of Tender Error! Bookmark not defined.

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Occupational health and safety specification for Meriting roads & stormwater ward 18 phase 4

1 Scope

This health and safety specification in respect of an engineering and construction works contract:

- a) provides the overarching framework within which the Principal Contractor is required to demonstrate compliance with certain requirements for occupation health and safety established by the Occupational Health and Safety Act of 1993 (Act No. 85 of 1993) and its regulations, Construction Regulations 2014, Electrical installation regulations as well as applicable Municipality By laws.
- b) establishes the manner in which the Principal Contractor is to manage the risk of health and safety incidents in the execution of the contract; and
- c) establishes the manner in which the Principal contractor will interact with the Clients Agent.

Note: 1) This specification establishes specific requirements to enable the Client and the Principal contractor to satisfy the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), the Construction Regulations 2014 as well as applicable Municipal By laws.

- 2) The Construction Regulations, 2014, require the Client or its appointed Agent to stop any Contractor from executing construction work which is not in accordance with the Contractor's health and safety plan for the site or which poses to be a threat to the health and safety of persons.
- 3) This specification establishes health and safety requirements Site specific requirements for health and safety as stated in the scope of work associated with a contract.

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2 Definitions

Act: The Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)

Competent person: any person having the knowledge, training and experience specific to the work or task being performed

Employer's Health and Safety Agent: the person appointed as agent by the Employer in terms of Regulation 4(5) of the Construction regulations and named in the contract data as the being the employer's agent responsible for health and safety matters

ergonomics: the application of scientific information concerning humans to the design of objects, systems and the environment for human use in order to optimize human well-being and overall system performance

hazard: a source of or exposure to danger

hazard identification: 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 plan: a documented plan which addresses hazards identified and includes safe work procedures to mitigate, reduce or control the hazards identified.

healthy: free from illness or injury attributable to occupational causes

incident: an event or occurrence occurring at work or arising out of or in connection with the activities of persons at work, or in connection with the use of plant or machinery, in which, or in consequence of which:

- a) any person dies, becomes unconscious, suffers the loss of a limb or part of a limb or is otherwise injured or becomes ill to such a degree that he is likely either to die or to suffer a permanent physical defect or likely to be unable for a period of at least 14 days either to work or to continue with the activity for which he was employed or is usually employed;
- b) a major incident occurred; or
- c) the health or safety of any person was endangered and where:
 - i) a dangerous substance was spilled;
 - ii) the uncontrolled release of any substance under pressure took place;
 - iii) machinery or any part thereof fractured or failed resulting in flying, falling or uncontrolled moving objects; or machinery ran out of control

inspector: a person designated as such under section 28 the Act

major incident: an occurrence of catastrophic proportions, resulting from the use of plant or machinery, or from activities at a workplace

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reasonably practicable: practicable having regard to:

- a) the severity and scope of the hazard or risk concerned;
- b) the state of knowledge reasonably available concerning that hazard or risk and of any means of removing or mitigating that hazard or risk;
- c) the availability and suitability of means to remove or mitigate that hazard or risk; and
- d) the cost of removing or mitigating that hazard or risk in relation to the benefits deriving there from;

registered person: a person registered in terms of the Electrical Installation Regulations

risk: the probability that injury or damage will occur

safe: free from any hazard

scaffold: any temporary elevated platform and supporting structure used for providing access to and supporting workmen or materials or both

3 Structure

- a) any building, steel or reinforced concrete structure (not being a building), railway line or siding, bridge, waterworks, reservoir, pipe or pipeline, cable, sewer, sewage works, fixed vessels, road, drainage works, earthworks, dam, wall, mast, tower, tower crane, batching plants, pylon, surface and underground tanks, earth retaining structure or any structure designed to preserve or alter any natural feature, and any other similar structure;
- b) any formwork, false work, scaffold or other structure designed or used to provide support
- c) or means of access during construction work; or
- d) any fixed plant in respect of work which includes the installation, commissioning, decommissioning or dismantling and where any such work involves a risk of a person falling two metres or more

substance: any solid, liquid, vapour, gas or aerosol, or combination thereof

suitable: capable of fulfilling or having fulfilled the intended function or fit for its intended purpose

workplace: any premises or place where a person performs work in the course of his employment

4 Interpretation

The Act and its associated regulations shall have precedence in the interpretation of any ambiguity or inconsistency between it and this specification.

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Compliance with the requirements of this specification does not necessarily result in compliance with the provisions of the Act.

5 Requirements

General requirement

The Principal Contractor shall:

- a) create and maintain a safe and healthy work environment,
- b) execute the works in a manner that complies with all the requirements of the Act and all its associated regulations, Applicable Municipal By Laws and in so doing, minimize the risk of incidents occurring; and
- c) respond to the notices issued by the Client's Health and Safety Agent as follows:
 - 1) Improvement Notice: improve health and safety performance over time so that repeat notices are not issued;
 - 2) Contravention Notice: rectify contravention as soon as possible;
 - 3) Prohibition Notice: terminate affected activities with immediate effect and only recommence activities when it is safe to do so.

Administration

Notification of intention to commence construction work

The Principal Contractor shall notify the Provincial Director of Labour in writing using a form Annexure 2 of the Construction Regulations issued in terms of the Act before construction work commences and retain a copy of such notification in the health and safety file where such work:

- a) involves the demolition of a structure exceeding a height of 3m;
- b) involves the use of explosives to perform construction work;
- c) involves the dismantling of fixed plant at a height greater than 3m;
- d) exceeds 30 days or will involve more than 300 person days of construction work; and includes:
 - i) excavation work deeper than 1m
 - ii) working at a height greater than 3 m above ground or a landing.

The Principal Contractor shall ensure that no work commences on an electrical installation which requires a new supply or an increase in electricity supply before the person who supplies or contracts or agrees to supply electricity to that

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electrical installation has been notified of such work.

The Principal Contractor shall ensure that no asbestos work is carried out before the Provincial Director of the Department of Labour has been notified in writing.

Copy of the Act

The Principal Contractor shall ensure that a copy of the Act and relevant regulations is available on site for inspection by any person engaged in any activity on the site.

Good standing with the compensation fund or a licensed compensation insurer

The Principal Contractor shall before commencing with any works on the site provide the Client's Health and Safety Agent with proof of good standing with the compensation fund or with a licensed compensation insurer.

Emergency procedures

The Principal Contractor shall submit for acceptance to the Client's Health and Safety Agent an emergency procedure which include but not limited to fire, spills, accidents to employees, exposure to hazardous substances, which:

- a) identifies the key personnel who are to be notified of any emergency.
- b) sets out details including contact particulars of available emergency services; and
- c) the actions or steps which are to be taken during an emergency.

The Principal Contractor shall within 24 hours of an emergency taking place notify the Client's Health and Safety Agent in writing of the emergency and briefly outline what happened and how it was dealt with.

Health and safety file

The Principal Contractor shall maintain on site a health and safety file which contains copies of the following, as relevant:

- a) documents required prior to commencing with physical construction activities**
 - 1) the Principal Contractor's health and safety policy, signed by the chief executive officer, which outlines the Contractor's objectives and how they will be achieved and implemented by the Contractor;
 - 2) the notification made to the Provincial Director of Labour, and if relevant, the notification of the person who supplies or contracts or agrees to supply electricity to that electrical installation;
 - 3) the letters of appointment, as relevant, of the construction Manager for the site in respect of construction works covered by the Construction Regulations and the registered person responsible for the electrical installation covered by the Electrical Installations Regulations;
 - 4) a copy of the certificate of registration of the registered person responsible for the electrical installation

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covered by the Electrical Installation Regulations;

- 5) the approval of the design of the part of an electrical installation which has a voltage in excess of 1 kV by a person deemed competent in terms of the Electrical Installations Regulations;
- 6) proof of registration of the electrical contractor who undertakes the electrical installation in terms of the Electrical Installation Regulations;
- 7) the preliminary hazard identification undertaken by a competent person;
- 8) the organ gram which outlines the roles and responsibilities of the construction supervisor's assistants and safety officers; and
- 9) the Principal contractor's health and safety plan;
- 10) the emergency procedures;
- 11) the procedure for the replacement of lost, stolen, worn or damage personal protective clothing and
- 12) proof that the Principal contractor is registered and in good standing with the compensation fund or with a licensed compensation insurer;

b) documents required after construction activities have commenced

- 1) the letters of appointments, if relevant, of:
 - i) persons who are required to assist the construction Manager;
 - ii) safety officers;
 - iii) health and safety representatives;
 - iv) replacement construction supervisor, and
 - v) assistants of construction supervisor.
- 2) any revisions to the organ gram which outlines the roles and responsibilities of the construction Manager's assistants and safety officers;
- 3) each and every subcontract agreement;
- 4) proof that every subcontractor is registered and in good standing with the compensation fund or with a licensed compensation insurer;
- 5) proof of all subcontractor's induction training whenever it is conducted;
- 6) copies of the minutes of the Principal Contractor's subcontractors health and safety meetings;
- 7) copies of each of the Principal Contractor's subcontractors' health and safety policy, signed by the chief executive officer, which outlines the subcontractor's objectives and how they will be achieved and

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implemented by the subcontractor;

- 8) the health and safety plans of all the Principal Contractor's subcontractors who are required to provide such plans;
- 9) a comprehensive and updated list of all the subcontractors employed on site by the Principal contractor, indicating the type of work being performed by such sub-contractors;
- 10) the outcomes of the monthly audits for compliance with the approved health and safety plan of each and every sub-contractor working on the site;
- 11) any report made to an inspector by the health and safety committee;
- 12) the minutes of all health and safety meetings and any recommendations made to the Principal Contractor by the health and safety committee;
- 13) the findings of all audit reports made regarding the implementation of the Principal Contractor's or a subcontractor's health and safety plan;
- 14) the inputs of the safety officer, if any, into the health and safety plan;
- 15) details of induction training conducted whenever it is conducted including the list of attendees;
- 16) proof of the following where suspended platforms are used:
 - i) a certificate of system design issued by a professional engineer, professional certificated engineer or a professional engineering technologist;
 - ii) proof of competency of erectors;
 - iii) proof of compliance of operational design calculations with requirements of the system design certificate;
 - iv) proof of performance test results;
 - v) sketches indicating the completed system with the operational loading capacity of the platform;
 - vi) procedures for and records of inspections having been carried out;
 - vii) procedures for and records of maintenance work having been carried out;
 - viii) proof that the prescribed documentation has been forwarded to the provincial director;
- 17) letters of appointments for competent persons to supervise the activities which law requires to be so supervised;
- 18) a copy of risk assessments made by competent persons
- 19) records of the register of inspections made by a competent person immediately before and during the placement of concrete or any other load on formwork;
- 20) the names of the first aiders on site and copies of the first aid certificates of competency;

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- 21) the names of the persons who are in possession of valid certificate of competency in first aid and copies of such certificates;
- 22) details of all incidents together with the Contractor's report on such incident; and
- 23) the record of inspections carried out by the designers of structures to ensure compliance with designs.

The health and safety file shall be made available for inspection by any inspector, subcontractor, the Project Manager, the Client's Health and Safety Agent or employee of the Contractor upon the request of such persons.

The Principal Contractor shall hand over the health and safety file to the Client's Health and Safety Agent upon completion of the contract and if relevant, a certificate of compliance accompanied by a test report for the electrical installation in accordance with the provisions of the Electrical Installation Regulations.

Health and safety committee

The Principal Contractor shall convene health and safety meetings whenever more than two health and safety representatives have been appointed for the site. These meetings shall be attended by all health and safety representatives and persons nominated by the Principal Contractor. Such meetings shall be convened at least once every month to:

- a) make recommendations to the Principal Contractor regarding any matter affecting the health or safety of persons on the site; and
- b) discuss any incident on the site in which or in consequence of which any person was injured, became ill or died.

The Principal Contractor shall consult with the health and safety committee on the development, monitoring and review of the risk assessment.

The Principal Contractor shall ensure that minutes of the health and safety committee meetings are kept.

Inspections, formal enquires and incidents

The Principal Contractor shall inform the relevant safety representative:

- a) beforehand of inspections, investigations or formal inquiries of which he has been notified by an inspector; and
- b) as soon as reasonably practicable of the occurrence of an incident on the site.

The Principal Contractor shall record all incidents and notify the Client's Health and Safety Agent of any incident, except in the case of a traffic accident on a public road, as soon as possible after it has occurred and report such incidence to an inspector.

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The Principal Contractor shall investigate all incidents and issue the Client's Health and Safety Agent with copies of such investigations.

Personal protective equipment and clothing

The Principal Contractor shall ensure that:

- a) all workers are issued with the necessary personal protective clothing;
- b) all workers are identifiable at all times by having the company for which they work for printed on the back or front of their overalls; and
- c) clear procedures are in place for the replacement of lost, stolen, worn or damage personal protective clothing.

Appointments

Health and safety representatives

The Principal Contractor shall appoint in writing one health and safety representative for every 50 employees working on the site, whenever there are more than 20 employees on the site, to:

- a) review the effectiveness of health and safety measures;
- b) identify potential hazards and potential major incidents;
- c) in collaboration with his employer, examine the causes of incidents;
- d) investigate complaints by any employee of the Principal Contractor relating to that employee's health or safety on the site;
- e) make representations to the Principal Contractor on matters arising from a), b), c) or d) or on general matters affecting the health or safety of the employees at the workplace;
- g) inspect the site with a view to, the health and safety of employees, at regular intervals;
- h) participate in consultations with inspectors at the workplace and accompany inspectors on inspections of the workplace; and
- i) participate in any internal health or safety audit.

The Principal Contractor shall provide the health and safety representatives with the necessary assistance, facilities and training to carry out the functions established in 4.3.1

- c) as soon as reasonably practicable of the occurrence of an incident on the site.

The Principal Contractor shall record all incidents and notify the Client's Health and Safety Agent of any

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incident, except in the case of a traffic accident on a public road, as soon as possible after it has occurred and report such incidence to an inspector.

The Principal Contractor shall investigate all incidents and issue the Client's Health and Safety Agent with copies.

Personal protective equipment and clothing

The Principal Contractor shall ensure that:

- d) all workers are issued with the necessary personal protective clothing;
- e) all workers are identifiable at all times by having the company for which they work for printed on the back or front of their overalls; and
- f) clear procedures are in place for the replacement of lost, stolen, worn or damage personal protective clothing.

Appointments

Health and safety representatives

The Principal Contractor shall appoint in writing one health and safety representative for every 50 employees working on the site, whenever there are more than 20 employees on the site, to:

- f) review the effectiveness of health and safety measures;
- g) identify potential hazards and potential major incidents;
- h) in collaboration with his employer, examine the causes of incidents;
- i) investigate complaints by any employee of the Principal Contractor relating to that employee's health or safety on the site;
- j) make representations to the Principal Contractor on matters arising from a), b), c) or d) or on general matters affecting the health or safety of the employees at the workplace;
- j) inspect the site with a view to, the health and safety of employees, at regular intervals;
- k) participate in consultations with inspectors at the workplace and accompany inspectors on inspections of the workplace; and
- l) participate in any internal health or safety audit.

The Principal Contractor shall provide the health and safety representatives with the necessary assistance, facilities and training to carry out the functions established in 4.3

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Appointment of construction Manager and supervisor as well as safety officer

The Principal Contractor shall, prior to commencing the work, appoint a full-time competent employee in writing as the construction Manager for the site, with the duty of supervising the performance of the work falling within the scope of the contract and may appoint one or more competent employees to assist the appointed construction Manager.

The Principal Contractor may, having considered the size of the project, the degree of dangers likely to be encountered or the accumulation of hazards or risks on the site, appoint a full-time or part-time construction safety officer registered with a professional body in accordance with construction Regulations 2014 in writing, who has in the Principal Contractor's opinion the necessary competencies and resources, to assist the Principal Contractor in the control of all safety related aspects on the site.

The Principal Contractor shall compile and maintain an organ gram which outlines the roles and responsibilities of the construction Manager's assistants and safety officers.

Competent persons

The Principal Contractor shall appoint in writing competent persons to supervise or inspect, as relevant, any of the following:

- a) . formwork and support work operations;
- b) excavation work;
- c) demolition work;
- d) scaffolding work operations;
- e) suspended platform work operations;
- f) material hoists;
- g) operation of batch plants;
- h) explosive power tools;
- i) vehicles and mobile equipment;
- j) fire equipment; and
- g) the stacking and storage of articles on the site.

The Contractor shall appoint in writing competent persons to:

- a) induct employees in health and safety; and

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- b) prepare a fall protection plan.

Client's health and safety agent

The Client's Health and Safety Agent shall:

- a) audit the Principal Contractor's compliance with the requirements of this specification prior to the commencement of any physical construction activities on the site;
- b) accept or reject all safety plans, giving reasons for rejecting such plans;
- c) monitor the effective implementation of all safety plans;
- d) conduct periodic and random audits on the health and safety file to establish compliance with the requirements of this specification;
- e) visit the site at regular intervals to conduct site inspections, and based upon such visits issue, wherever necessary, Improvement Notices, Contravention Notices and Prohibition Notices, to the Contractor or any of the Contractor's subcontractors with a copy to the Project Manager and, where relevant, to the Contractor.

The Principal Contractor shall invite the Client's Health and Safety Agent to audit compliance with the requirements of this specification before commencing with any physical construction activity on the site.

Creating and maintaining a safe and healthy work environment

General

The Principal Contractor shall with respect to the site and the construction works that are contemplated:

- a) cause a preliminary hazard identification to be performed by a competent person before commencing any physical construction activity;
- b) evaluate the risks associated with such work constituting a hazard to the health and safety of such employees and the steps that need to be taken to comply with the Act; and
- c) as far as is reasonably practicable, prevent the exposure of such employees to the hazards concerned or, where prevention is not reasonably practicable, minimize such exposure.

The Principal Contractor shall ensure that:

- a) all reasonably practicable steps are taken to prevent the uncontrolled collapse of any new or existing structure

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or any part thereof, which may become unstable or is in a temporary state of weakness or instability due to the carrying out of construction work;

- b) no structure or part of a structure is loaded in a manner which would render it unsafe; and
- c) account of information, if any, provided by the designer of the structure is taken into account in the risk assessment;

Note: The information provided by the designer should outline known or anticipated dangers or hazards relating to the works and make available all information required for the safe execution of the work. It should provide as relevant, geotechnical information (or make reference to reports provided in the site information), the loading the structure is designed to withstand, the methods and sequence of construction.

The Principal Contractor shall carry out regular inspections and audits to ensure that the works are being performed in accordance with the requirements of this specification.

Risk assessment

The Principal Contractor shall before the commencement of any work on site and during construction work, cause a risk assessment to be performed by a competent person appointed in writing. Such an assessment shall as a minimum:

- a) identify the risks and hazards to which persons may be exposed to;
- b) analyse and evaluate the identified risks and hazards;
- c) document a plan of safe work procedures, including the use of any personal protective equipment or clothing and the undertaking of periodic "toolbox talks" or inductions before undertaking hazardous work, to mitigate, reduce or control the risks and hazards that have been identified;
- d) provide a monitoring plan; and
- e) provide a review plan.

Note: A risk assessment is an important step in protecting workers as well as complying with the law. It helps to focus on the risks that really matter in a particular workplace – the ones with the potential to cause real harm. Workers and others have a right to be protected from harm caused by a failure to take reasonable control measures. The following four steps are recommended:

- 1) **Identify the hazards** by looking at what could reasonably be expected to cause harm, ask employees or their representatives what they think, obtain advice from trade associations or publications on health and safety, check manufacturer's instructions or data sheets for chemicals and equipment as they can be very helpful in spelling out the hazards and putting them in their true perspective, review accident and ill-health records, think about long-term hazards to health (e.g. high levels of noise or exposure to harmful substances) as well as safety hazards etc.
- 2) **Identify who may be harmed and how** by identifying how groups of people might be harmed

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i.e. what type of injury or ill health might occur.

- 3) **Evaluate the risks and decide on precautions** by doing everything 'reasonably practicable' to protect people from harm i.e. by looking at how things are done, what controls are in place and how the work is organised and comparing this against good practice to see if more can be done to bring practices up to standard. Consider if the hazard can be got rid of all together, and if not how can the risks be controlled so that harm is unlikely, e.g. try a less risky option (e.g. switch to using a less hazardous chemical); prevent access to the hazard (e.g. by guarding); organise work to reduce exposure to the hazard (e.g. put barriers between pedestrians and traffic); issue personal protective equipment (e.g. clothing, footwear, goggles etc); and provide welfare facilities (eg first aid and washing facilities for removal of contamination).
- 4) **Record the findings** by writing down the findings of the risk assessment.

The Principal Contractor shall ensure that as far as is reasonably practicable, ergonomic related hazards are analysed, evaluated and addressed in the risk assessment.

Notwithstanding the provisions of the fall protection plan, the Principal Contractor shall ensure that:

- a) all unprotected openings in floors, edges, slabs, hatchways and stairways are adequately guarded, fenced or barricaded or that similar means are used to safeguard any person from falling through such openings;
- b) no person works in an elevated position, unless such work is performed safely as if working from a scaffold or ladder;
- c) notices are conspicuously placed at all openings where the possibility exists that a person might fall through such openings;
- d) fall prevention and fall arrest equipments:
 - i) suitable and of sufficient strength for the purpose or purposes for which it is being used having regard to the work being carried out and the load, including any person, it is intended to bear; and
 - ii) securely attached to a structure or plant and the structure or plant and the means of attachment thereto is suitable and of sufficient strength and stability for the purpose of safely supporting the equipment and any person who is liable to fall;
- e) fall arrest equipment is only used where it is not reasonably practicable to use fall prevention equipment; and
- f) suitable and sufficient steps are taken to ensure, as far as is reasonably practicable, that in the event of a fall by any person, the fall arrest equipment or the surrounding environment does not cause injury to the person.

Where roof work is being performed on a construction site, the Contractor shall ensure that it is indicated in the fall protection plan that:

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- a) the roof work has been properly planned;
- b) the roof erectors are competent to carry out the work;
- c) no employees are permitted to work on roofs during inclement weather conditions or if weather conditions are a hazard to the health and safety of the employees; prominent warning notices are to be placed where all covers to openings are not of
- d) sufficient strength to withstand any imposed loads and where fragile material exists;
- e) the areas mentioned in paragraph (d) are to be barricaded off to prevent persons from entering;
- f) suitable and sufficient platforms, coverings or other similar means of support have been provided to be used in such a way that the weight of any person passing across or working on or from fragile material is supported; and
- g) there is suitable and sufficient guard-rails or barriers and toe-boards or other similar means of protection to prevent, so far as is reasonably practicable, the fall of any person, material or equipment.

Health and safety plans

The Principal Contractor shall prior to commencing the works to which this specification applies, submit to the Client's Health and Safety Agent for approval a suitable and sufficiently documented health and safety plan, based on this specification and the risk assessment that is conducted.

The health and safety plan shall as a minimum provide:

- a) the information contained in Table 1 in respect of each of the hazards associated with work falling within the scope of the contract (see Figure 1); and

Table 1: Example of the format of a health and safety plan

What are the hazards relating to work tasks?	Who might be harmed and how?	What are the safe work procedures for the site?	What further action is necessary (monitoring and review)?	Action by whom	Action by when

- b) an outline of the manner in which the Principal contractor intends complying with the requirements of this specification.

The Principal contractor shall discuss the submitted health and safety plan with the Clients' Health and Safety Agent, modify such plan in the light of the discussions and resubmit the modified plan for approval.

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The Principal contractor shall apply the approved health and safety plan from the date of its commencement and for the duration of the works to which this specification applies.

The Principal contractor shall conduct periodic audits for compliance with the approved health and safety plan at intervals agreed upon with the Employer's Health and Safety Agent, but at least once every month.

The Principal contractor shall update the health and safety plan whenever changes to the works are brought about

Fall protection plan

The Principal contractor shall require a competent person to prepare a fall protection plan in compliance with the requirements of the Construction Regulations.

The Principal contractor shall ensure that the construction supervisor is in possession of the most recently updated version of the fall protection plan.

Responsibilities towards employees and visitors

The Principal Contractor shall as far as is reasonably practicable, cause every employee to be made conversant with the hazards to his health and safety attached to any work which he has to perform, any article or substance which he has to produce, process, use, handle, store or transport and any plant or machinery which he is required or permitted to use, as well as with the precautionary measures which should be taken and observed with respect to those hazards or safe work procedures.

The Principal contractor shall ensure that all employees under his or her control are:

- a) informed, instructed and trained by a competent person regarding any hazard and the related work procedures before any work commences, and thereafter at such times as may be determined in the risk assessment; and
- b) issued with proof of health and safety induction training issued by a competent person and carry proof of such induction when working onsite.

The Principal contractor shall cause a record of training to be kept which indicates the names, identity numbers and job description of all those who attended such training.

The Principal contractor shall not allow or permit any employee to enter the site, unless such person has undergone health and safety induction training pertaining to the hazards prevalent on the site at the time of entry.

The Principal contractor shall ensure that each visitor to a construction site, save where such visitor only visits the site office and is not in direct contact with the construction work activities:

- a) undergoes health and safety instruction pertaining to the hazards prevalent on the site; and
- b) is provided with the necessary personal protective equipment.

The Principal contractor shall provide suitable on-site signage to alert workers and visitors to health and safety requirements. Such signage shall include but not be limited to:

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- a) unauthorized entrance prohibited;
- b) signage to indicate what personal protective equipment is to be worn; and
- c) activity related signs.

The Principal contractor shall not permit any person who is or who appears to be under the influence of intoxicating liquor or drugs, to enter or remain at workplace.

Subcontractors

The Principal contractor may only subcontract work in terms of a written subcontract and shall only appoint a subcontractor should he be reasonably satisfied that such a subcontractor has the necessary competencies and resources to safely perform the work falling within the scope of the contract. Such a subcontract shall require that the subcontractor to:

- a) co-operate with the Principal contractor as far as is necessary to enable both the Principal contractor and sub-contractor to comply with the provisions of the Act; and
- b) as far as is reasonably practicable, promptly provide the Principal contractor with any information which might affect the health and safety of any person at work carrying out work or any person who might be affected by the work of such a person at work or which might justify a review of the health and safety plan.

The Principal contractor shall provide any sub-contractor who is submitting a tender or appointed to perform a sub-contract falling within the scope of the contract, with the relevant sections of this specification and any work specific information which might be pertinent to the sub-contract.

The Principal contractor shall take reasonable steps as are necessary to ensure:

- a) co-operation between all sub-contractors to enable each of those sub-contractors to comply with the requirements of the Act and associated regulations; and that each sub-contractor's health and safety plan is implemented

The Principal contractor shall conduct periodic audits for compliance with the approved health and safety plan of each and every sub-contractor working on the site at intervals agreed upon with such subcontractors, but at least once per month.

The Principal contractor shall stop any subcontractor from executing construction work which is not in accordance with the Contractor's or subcontractor's health and safety plan for the site or which poses a threat to the health and safety of persons.

The Principal contractor shall ensure that where changes to the works occur, sufficient health and safety information and appropriate resources are made available to subcontractor to execute the work safely.

The Principal contractor shall ensure that:

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- a) every subcontractor is registered and in good standing with the compensation fund or with a licensed compensation insurer prior to work commencing onsite;
- b) potential subcontractors submitting tenders have made provision for the cost of health and safety measures during the construction process; and
- c) every subcontractor has in place a documented health and safety plan prior to commencing any work on site which falls within the scope of the contract.

The Principal contractor shall receive, discuss and approve health and safety plans submitted by subcontractors.

The Principal contractor shall ensure that all subcontractors are informed regarding any hazard as stipulated in the risk assessment before any work commences, and thereafter at such times as may be determined in the risk assessment.

The Principal contractor shall reasonably satisfy himself that all employees of subcontractors are informed, instructed and trained by a competent person regarding any hazard and the related work procedures before any work commences, and thereafter at such times as may be determined in the risk assessment.

The Principal contractor shall satisfy himself that ensure that all subcontractor employees deployed in the site are:

- a) informed, instructed and trained by a competent person regarding any hazard and the related work procedures before any work commences, and thereafter at such times as may be determined in the risk assessment; and
- b) issued with proof of health and safety induction training issued by a competent person and carry proof such induction when working onsite.

First aid, emergency equipment and procedures

The Principal contractor shall where more than five employees are employed at a workplace, provide a first aid box or boxes at or near the workplace which shall be available and accessible for the treatment of injured persons at that workplace. Such first aid boxes shall contain suitable first aid equipment.

The Principal contractor shall ensure that where there are more than 10 employees employed on the site that for every group of up to 50 employees at that workplace, at least one person readily available during normal working hours, who is in possession of a valid certificate of competency in first aid.

Facilities for workers

The Principal Contractor shall provide and keep clean and fit for use at or within reasonable access of the site:

- a) at least one shower facility for every 15workers;

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- b) at least one sanitary facility for every 30 workers;
- c) changing facilities for each sex; and
- d) Sheltered eating areas.

The Principal contractor shall provide reasonable and suitable living accommodation for the workers at construction sites which are remote from their homes and where adequate transportation between the site and their homes, or other suitable living accommodation, is not available.

Signed this day of 20 at

..... (Place)

(Full name)..... (Signature)

On behalf of (Principal contractor/Agent)

Contractor Responsible Manager (responsible for signing Client's 'contract on behalf of the Principal contractor)

Witnesses

1.

2.

Signed this day of 20

at (Place)

(Full name)..... (Signature)

On Behalf of **Client/Agent**.

(Contracts and/or Project Manager)

Witnesses

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ANNEXURE A

**OCCUPATIONAL HEALTH AND SAFETY ACT, 1993
Regulation 3 of the Construction Regulations, 2003**

NOTIFICATION OF CONSTRUCTION WORK

1.(a) Name and postal address of principal contractor:

(b) Name and tel. no of principal contractor's contact person:

2. Principal contractor's compensation registration number: _____

3.(a) Name and postal address of client:

(b) Name and tel no of client's contact person or agent:

4.(a) Name and postal address of designer(s) for the project:

(b) Name and tel. no of designer(s) contact person:

5. Name and telephone number of principal contractor's construction supervisor on site appointed in terms of regulation 6.(1). _____

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6. Name/s of principal contractor's sub-ordinate supervisors on site appointed in terms of regulation 6.(2).

7. Exact physical address of the construction site or site office:

8. Nature of the construction work:

9. Expected commencement date: _____

10. Expected completion date: _____

11. Estimated maximum number of persons on the construction site.

12. Planned number of contractors on the construction site accountable to principal contractor:

13. Name(s) of contractors already chosen.

Principal Contractor

Date

Client

Date

- THIS DOCUMENT IS TO BE FORWARDED TO THE OFFICE OF THE DEPARTMENT OF LABOUR
PRIOR TO COMMENCEMENT OF WORK ON SITE.

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- ALL PRINCIPAL CONTRACTORS THAT QUALIFY TO NOTIFY MUST DO SO EVEN IF ANOTHER PRINCIPAL CONTRACTOR ON THE SAME SITE HAD DONE SO PRIOR TO THE COMMENCEMENT OF WORK.

GOVERNMENT NOTICE

DEPARTMENT OF LABOUR

No. R.

.....2003

Occupational Health and Safety Act, 1993

Incorporation of Safety Standards in the Construction Regulations, 2003

Under section 44 of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), I, Thembelani Waltermade Nxesi, Minister of Labour, after consultation with the Advisory Council for Occupational Health and Safety, hereby incorporate in the Construction Regulations, 2003 the health and safety standards specified in the Schedule.

M M S Mdladlana Minister of Labour.

SCHEDULE

1. Regulation 14(1)

The South African Bureau of Standards' Code of Practice SABS 085, as amended, entitled "The Design, Erection, Use and Inspection of Access Scaffolding".

2. Regulation 15(2)(a)

The South African Bureau of Standards' Standard Specification SABS EN 1808, as amended, entitled "Safety Requirements on Suspended Access Equipment – Design calculations, stability criteria, construction-tests".

The South African Bureau of Standards' Standard Front-end Specification SABS 1903, as amended, entitled "Safety Requirements on Suspended Access Equipment – Design calculations, stability criteria, construction-tests".

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Department of Labour

GUIDE TO THE GENERAL ADMINISTRATIVE REGULATIONS, 2003

Chief Directorate

of

Occupational Health and Safety

1. INTRODUCTION

2. As the name of the regulation indicates, the General Administrative Regulations determines the administrative procedure of the Occupational Health and Safety Act. This procedure was not placed in the Act itself owing to the fact that changes can be made to a Regulation with greater ease than that of a Section in the Act. A change to a Section of the Act needs to be passed by parliament whereas the Minister of the relevant Department can approve a change in a Regulation.
3. The General Administrative Regulations, as is the case with all other regulations, is an extension of the Act and should therefore be seen as a complete unit.

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- 3.1 Terms, which were previously defined in the Act, are not redefined in the Regulations. If a specific definition does not appear in the Regulations, then it should be available in Section 1 of the Act.

4. DEFINITIONS

5. All new phrases as well as words (expressions and words which differ from the standard dictionary definitions) that are used in this regulation, which have not been defined in the Act, will be defined in this regulation. Where the Act or regulation refers to “mean” the definition in the Act or regulation must be considered and where there’s reference made to “It Includes” definition from the Act and regulation including the oxford dictionary must be considered

6. ACCESS TO PREMISES

7. It is prohibited for an employer to refuse an inspector entry to perform his or her function because an inspector is entitled by the law to enter employer’s workplace.
8. Employers should always ensure that inspectors are accompanied by a person who has knowledge and experience of the activities and safety requirements of the workplace.

9. EXEMPTIONS

10. Any exemption, which has been granted to any person, shall be signed by the Chief Inspector of the Department of Labour. An person who wishes to apply for an exemption should forward his/her application to the office of the Chief Inspector in Pretoria. The application for exemption should indicate proof that the health and safety of persons who are likely to be affected by the exemption will not be prejudiced in consequences of it. Health and safety representatives and committees must be consulted during the whole process and given time to comment.

11. COPY OF THE ACT

- 11.1 Employees together with employers have certain duties and rights, which have been assigned to them in terms of the Act. In order to comply with the provisions of the Act and regulations, each employee must have access to a copy of the Act. This regulation requires that—

- 11.1.1 Each employer with 5 or more employees shall have a copy of at least one Act, which will be made readily available for perusal by the employee. Owing in the fact that a workplace can be made up of a very large area, and that the legislator did not intend to be unreasonable, various concessions are made. For example, a meter-reader in the town of Brits’ workplace is the Municipal area of Brits. In such a case it is expected that a copy of the Act be made available at the point where the employee reports for duty in the morning, or any other suitable position as agreed upon with the employer.

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- 11.1.2 Each employer with less than 5 employees, shall, if requested provide a copy of the Act for perusal by the employees. This includes farm workers and domestic servants.
- 11.1.3 The copy of the Act may be an electronic reproduction or from a library. The Act and Regulations are amended from time to time, and it is therefore important to remember that one must obtain a copy of the latest amendments to keep up to date with the current legislation.

12. HEALTH AND SAFETY COMMITTEES

- 12.1 Health and Safety committees are made up of all the Health and Safety Representatives together with an equal amount of employer appointee representatives to represent the employer (there can be more than one committee to avoid a large congregation of representatives). If more than two committees are established, each health and safety representative must be member of at least one of the committees. These committees are the point around which self-regulation revolves.
- 12.2 Employer should provide necessary equipment, facilities and stationery required by the committee in order them to perform their functions.
- 12.3 It is important to keep the records of the meeting as they can be used as evidence for action taken to eliminate hazards and vice versa

13. NEGOTIATIONS AND CONSULTATIONS BEFORE DESIGNATION OF HEALTH AND SAFETY REPRESENTATIVES

- 13.1 The regulation prescribes the items which must be agreed upon during negotiations between the employer and employees representatives. If a dispute arises between the employees and employers or his authorised representative, the matter should be referred for arbitration. Both parties shall submit a statement within a prescribed period to both the arbitrator and the other party concerned.
- 13.2 The statement is to contain the following information:
- 13.2.1 The proposal for the arrangements and procedures for the nomination of the Health and Safety Representatives.
- 13.2.2 The decision which is sought.
- 13.3 The arbitrator should then:
- 13.3.1 Determine when and where the arbitration procedure shall be held. The arbitration may be held in the absence of the party who failed to submit a statement to the arbitrator and other party;

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Employer

Witness 1

Witness 2

Contractor

Witness 1

Witness 2



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13.3.1.1 Determine whether a pre-hearing conference shall be held;

13.3.1.2 Determine which arbitration procedures shall be followed;

13.3.1.3 Determine the procedures for the admission of evidence;

13.3.1.4 Determine the admissibility of hearsay evidence; and

13.3.1.5 Determine other relevant procedural matters.

13.3.2 In terms of Section 17(2) of the Act both parties are to come to a decision within 14 days as to who the arbitrator shall be. If no decision can be made, the president of the Labour Court is to be notified in writing. The president of the Labour Court in consultation with the Chief Inspector shall appoint an arbitrator, whose decision shall be final. This arbitrator will be entitled to receive remuneration as is payable to an additional member of the Labour Court.

14. DESIGNATION OF HEALTH AND SAFETY REPRESENTATIVES

14.1 The employer must designate Health and Safety Representatives as follows:

14.1.1 Shops and offices— one for up to 100 employees; and

14.1.2 Workplaces other than shops and offices— one for up to 50 employees.

14.2 The employer shall ensure that employees designated as health and safety representatives meet the following requirements:

14.2.1 Employed in a full-time capacity in the specific workplace or section thereof;

14.2.2 Acquainted with conditions and activities at that workplace or section thereof, and

14.2.3 Taking into account the nature of hazards associated with the activities of the workplace or section thereof, the employer shall provide as far as is reasonable practicable health and safety training to the health and safety representatives on how to identify health and safety risks and how to conduct inspections of the workplace or section thereof.

15. REPORTING OF INCIDENTS AND OCCUPATIONAL DISEASES

15.1 Section 24 of the Act refers to certain incidents occurring at the workplace, or in connection with the use of machinery whereby a person dies or is injured to be extent where he is likely to die or could

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have resulted in a major incident. Such incidents should be reported to the Provincial Director on a WCL 1 or WCL 2 form within seven days.

- 15.2 Certain other types of incidents must be reported to the Provincial Director telephonically, facsimile or similar means of communication and these types of incidents are as follows—
- 15.2.1 Where a person, as a result of the incident;
- 15.2.2 Dies;
- 15.2.3 Becomes unconscious;
- 15.2.4 Suffers the loss of a limb or part thereof;
- 15.2.5 Is injured to the extent that he is likely to die;
- 15.2.6 Is injured to the extent that he is likely to be permanently disabled;
- 15.2.7 Is injured to the extent that he is likely to be off for a period of 14 days or more;
- 15.2.8 Cannot perform his normal duties (those duties for which he was employed).
- 15.3 An incident of major consequence arising out of the use of industrial equipment or machinery or industrial practices at a workplace.
- 15.4 The health and safety of any person is endangered and where –
- 15.4.1 A dangerous substance was spilled.
- 15.4.2 The uncontrolled release of any substance under pressure (pressure greater than 1 atmosphere) took place.
- 15.4.3 Machinery or any part thereof fractured or failed, resulting in flying, falling or uncontrolled moving objects; or
- 15.4.4 Machines, which ran out of control
- 15.5 These incidents should also be recorded and investigated in accordance to Regulation 8 of the General Administrative Regulations.
- 15.6 If an injured person is to die as a result of an incident, which has already been reported in terms of the above, the employer or user should report such death to the Provincial Director.
- 15.7 Any registered medical practitioner should, in terms of Section 25 of the Act, report all (to the employer and Chief Inspector) cases of occupational diseases or any other disease, which he believes arose out of a person's employment, which he/she has treated. This must be done within 14 days in the form of a WCL 22 form.
- 15.8 Any other person may in writing, give notice of any disease suspected to be an occupational disease, to the employer and chief inspector.

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16. RECORDING AND INVESTIGATION OF INCIDENTS

- 16.1 The employer or user of machinery should keep record and investigate all incidents referred to in terms of Section 24 of the Act together with any other incident, which resulted in the person concerned having had to receive medical treatment other than first aid.
- 16.2 These incidents must be recorded in the form of Annexure 1 of these regulations and be kept for a period of at least 3 years. This record shall be kept on the premises and available for perusal by an inspector.
- 16.3 The employer, a designated person, a health and safety representative or a member of the health and safety committee must investigate the above-mentioned incidents. This investigation should take place within 7 days from the date of incident and completed as soon as is reasonably practicable or within the contracted period of contract workers.
- 16.4 The employer should record the result of the investigation in the Annexure 1. The purpose of the investigation is to establish the cause of the incident together with the safety measures that can be implemented to prevent the re-occurrence of such incidents in the future.
- 16.5 The health and safety committee shall examine this record at their next meeting.

17. WITNESS AT AN INQUIRY

- 17.1 The chief inspector can, in terms of Section 32, direct an inspector to hold a formal inquiry as a result of an incident reported in terms of Section 24 (refer to Regulation 6). In such an instance, the inspector shall inform the employer or user of machinery of his intentions, and request the following from him/her:
- 17.1.1 That all persons witness to the incident; and
- 17.1.2 That any other person as required by the inspector be notified in connection with the time, date and venue of the formal inquiry.
- 17.2 The employer or user of machinery is to establish which persons are likely not to attend the inquiry and shall advise the inspector of the names and addresses of such persons to allow the inspector to subpoena such persons.

18. RETURNS

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- 18.1 An employer or user shall furnish the inspector with such information as requested for the purpose of the Administration of the Act.

C4.3 Site Administration Forms

All site administration documents will be handed over at the site handover meeting.

C4.4 Geological Investigation

Report available at request.

C4.5 Climatic Information

For the purpose of this Specification, the Lethabong Wastewater Treatment Works shall be regarded as a severe environment.

The works will have open liquid areas and the environment is damp. The prevailing winds can also carry spray from the works.

This environment is very corrosive to ferrous metals and, where the use of such metals cannot be avoided, the metals must be adequately protected, such protection systems being designed for a life of at least 15 years.

Various gasses are also present throughout the inlet works and these may contain hydrogen sulphide which, in addition to being corrosive to ferrous metal, is also corrosive to most non-ferrous metals. The effect on copper alloys can be particularly severe, often with disastrous effects on the reliability and life of switchgear, control systems, slip-rings, etc. Such equipment must therefore be adequately sealed and protected.

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Witness 1

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TENDER DRAWINGS

TENDER DRAWINGS

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Employer

Witness 1

Witness 2

Contractor

Witness 1

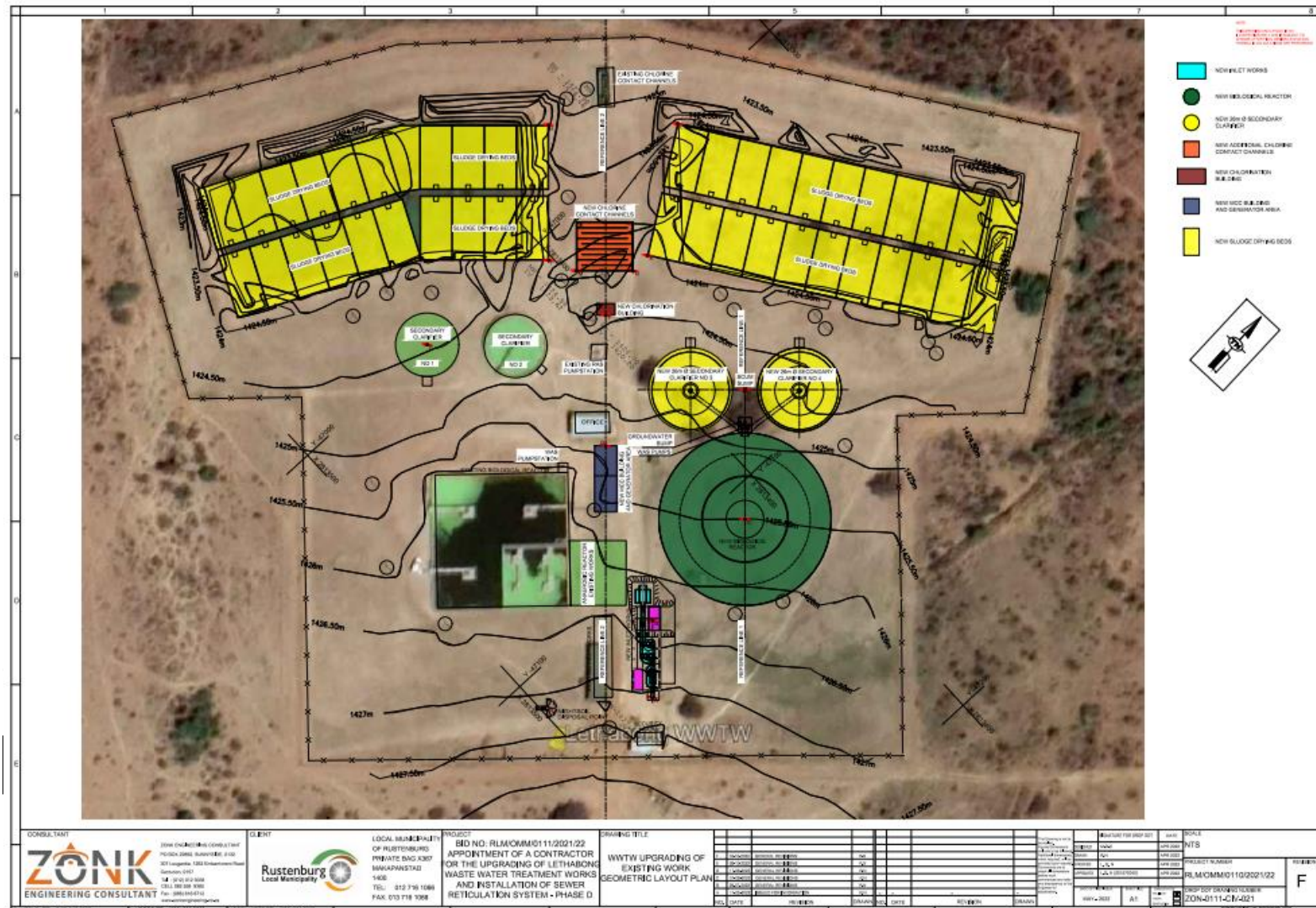
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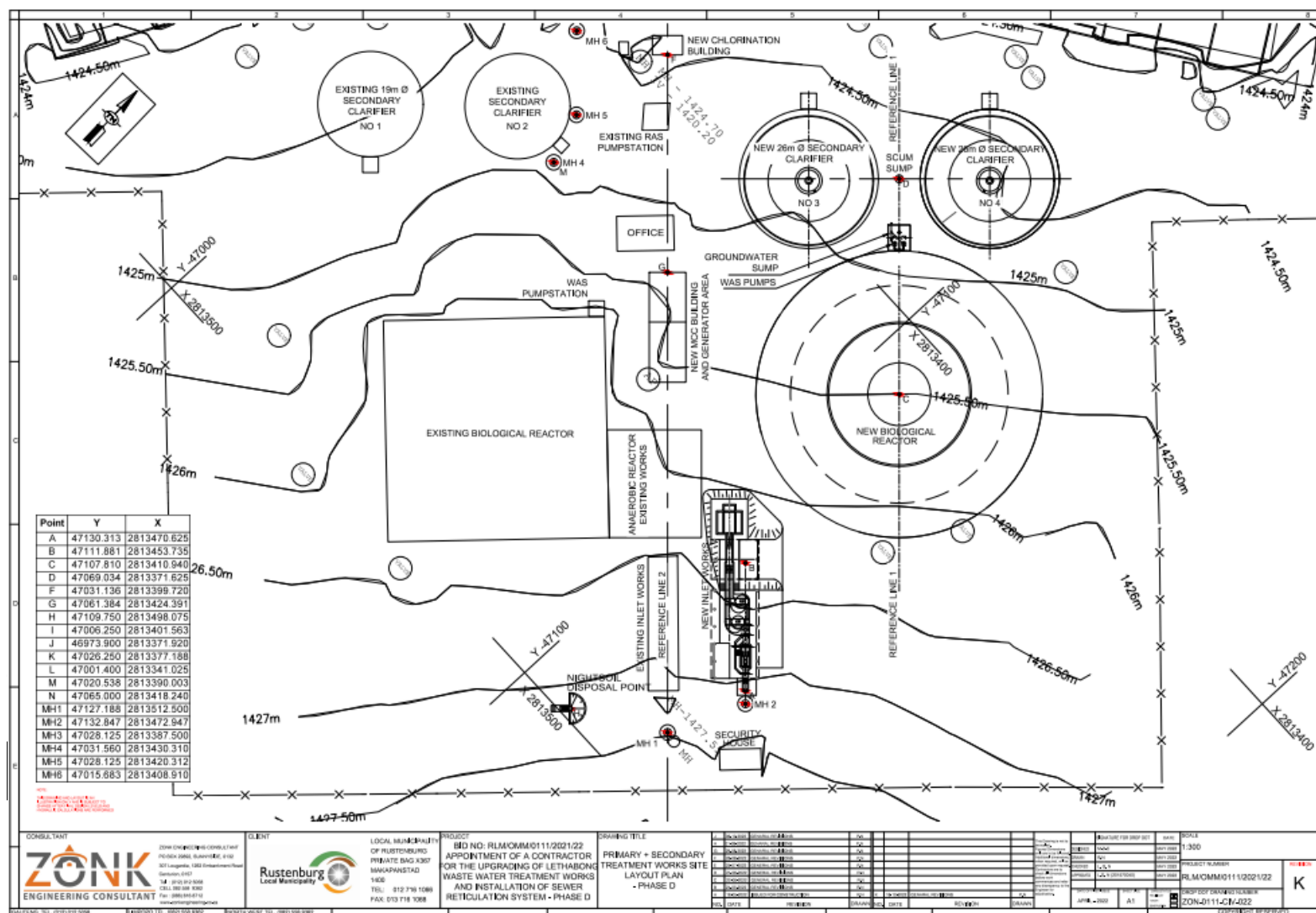
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The site plan illustrates the layout of a wastewater treatment facility. Key features include:

- Clarifiers:** Two existing secondary clarifiers (NO 1 and NO 2) and two new 26m diameter secondary clarifiers (NO 3 and NO 4).
- Drying Beds:** Multiple sludge drying beds located around the perimeter.
- Pump Stations:** Existing RAS Pump Station, WAS Pump Station, and a new MCC Building and Generator Area.
- Buildings:** New Chlorination Building, Office, and various contact channels.
- Infrastructure:** Groundwater sump, WAS pumps, and various reference lines (e.g., REFERENCE LINE 1, REFERENCE LINE 2).

Point	Y	X
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B	47111.881	2813453.735
C	47107.810	2813410.940
D	47069.034	2813371.625
F	47031.136	2813399.720
G	47061.384	2813424.391
H	47109.750	2813498.075
I	47006.250	2813401.563
J	46973.900	2813371.920
K	47026.250	2813377.188
L	47001.400	2813341.025
M	47020.538	2813390.003
N	47065.000	2813418.240
MH1	47127.188	2813512.500
MH2	47132.847	2813472.947
MH3	47028.125	2813387.500
MH4	47031.560	2813430.310
MH5	47028.125	2813420.312
MH6	47015.883	2813408.910

CONSULTANT

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PROJECT

RD NO. RLMMMO11/2021/22
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DRAWING TITLE

TERTIARY TREATMENT WORKS SITE LAYOUT PLAN - PHASE D

SCALE

As Shown for Deep Set

DATE

April 2022

BY

AT

REVISIONS

No.	Description	Date
1	Issue for Deep Set	April 2022

PROJECT NUMBER

RLMMMO11/2021/22

DRAWN BY

DRP DEE BROOKER/CLEVER

CHECKED BY

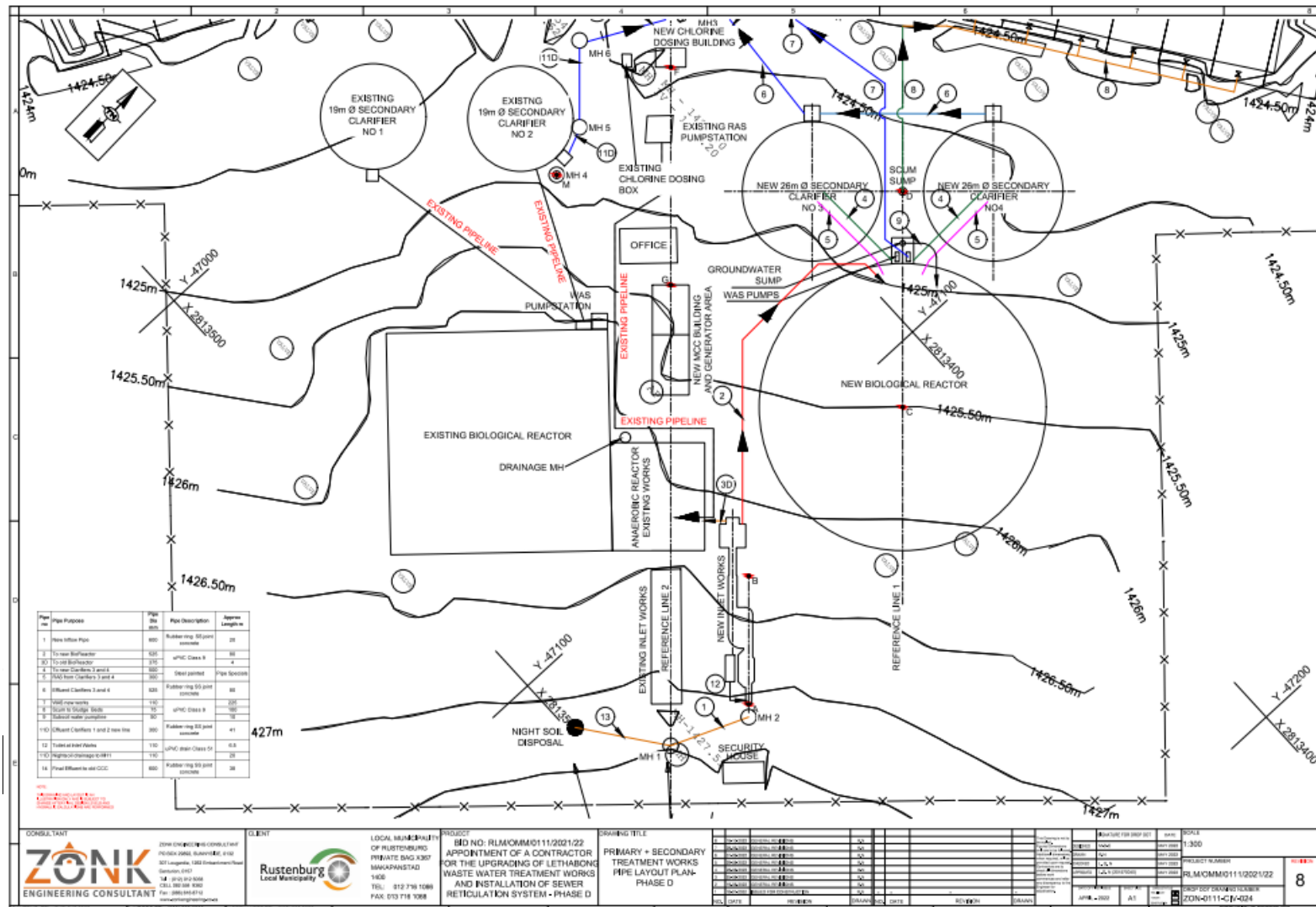
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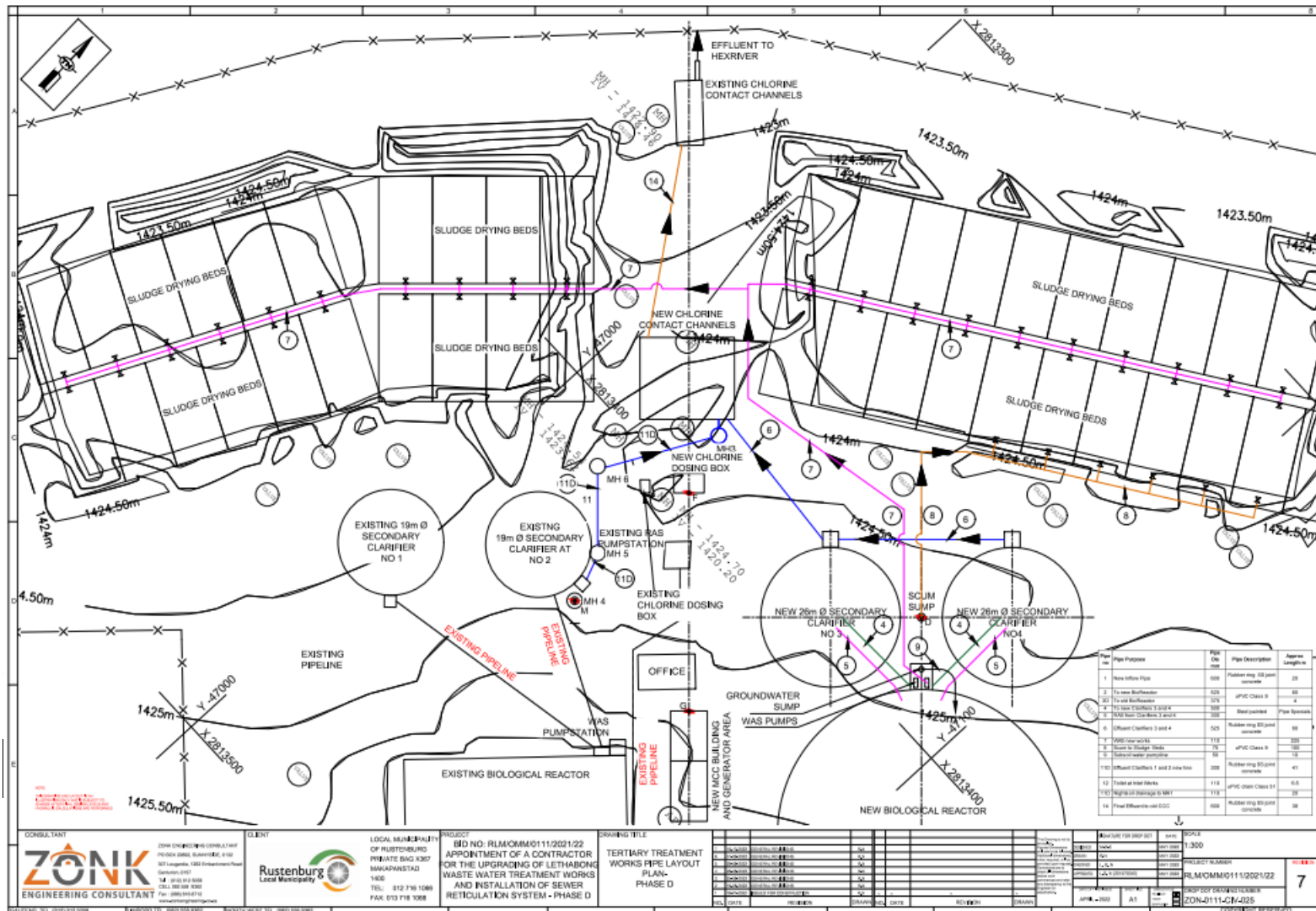




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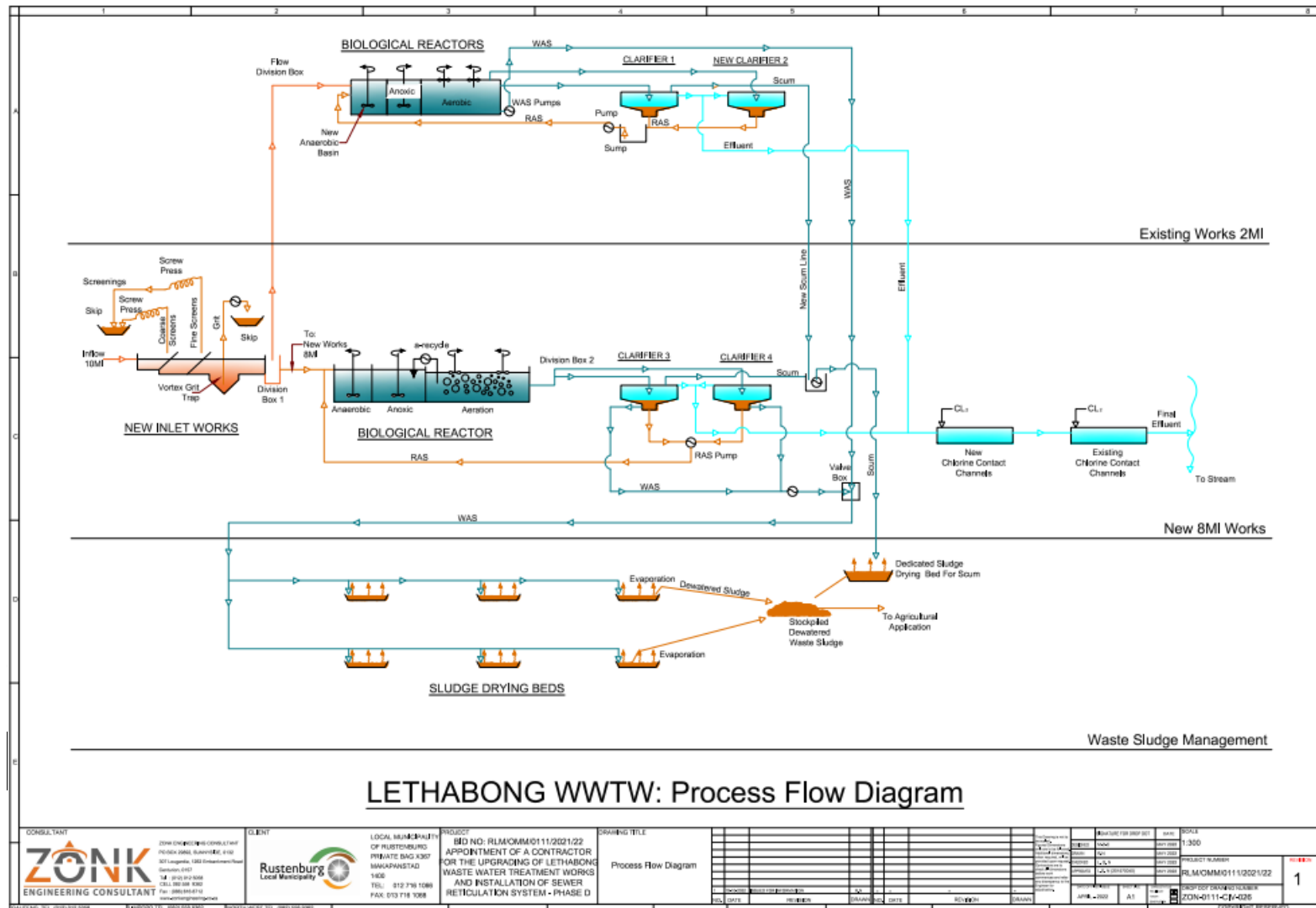




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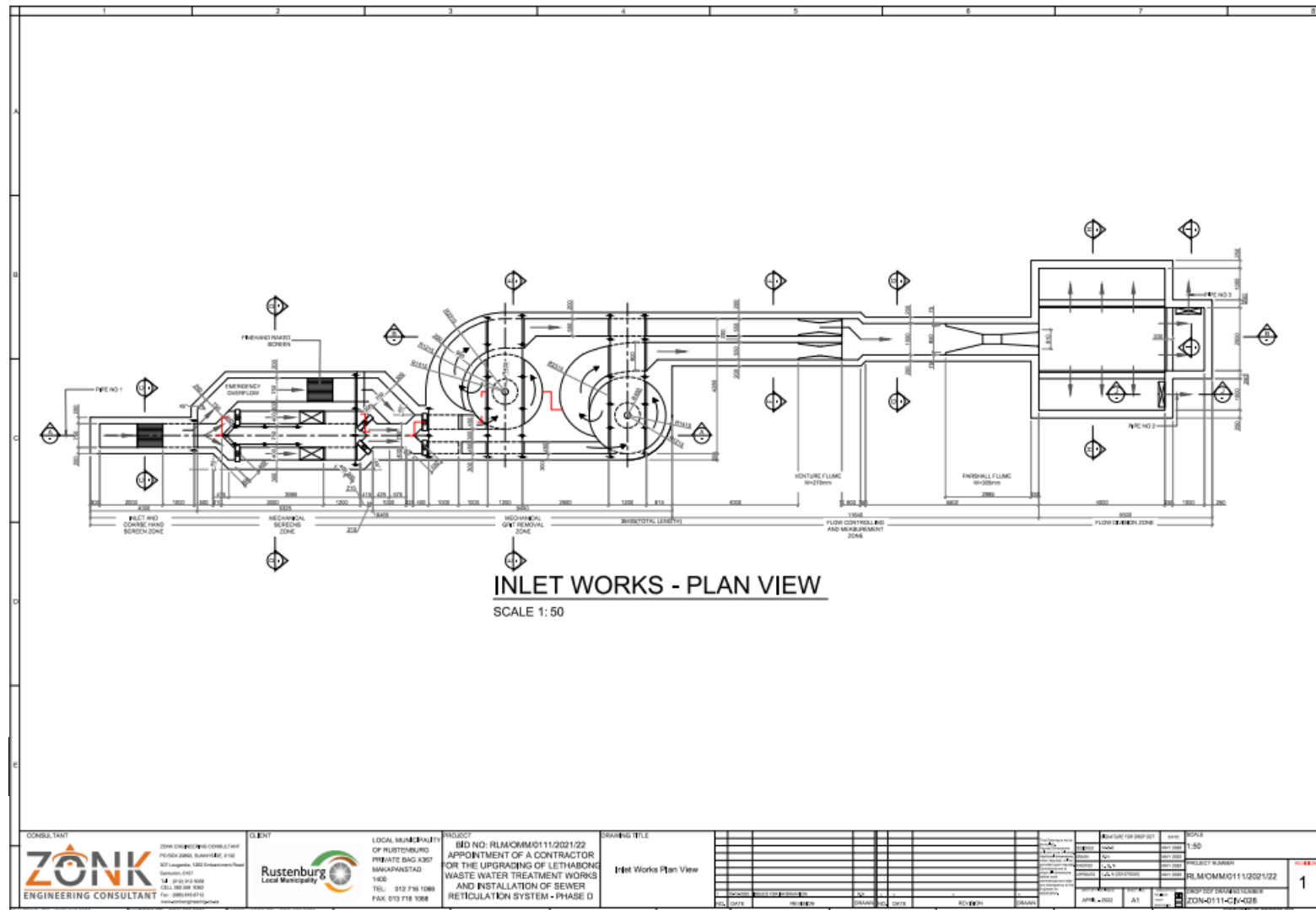
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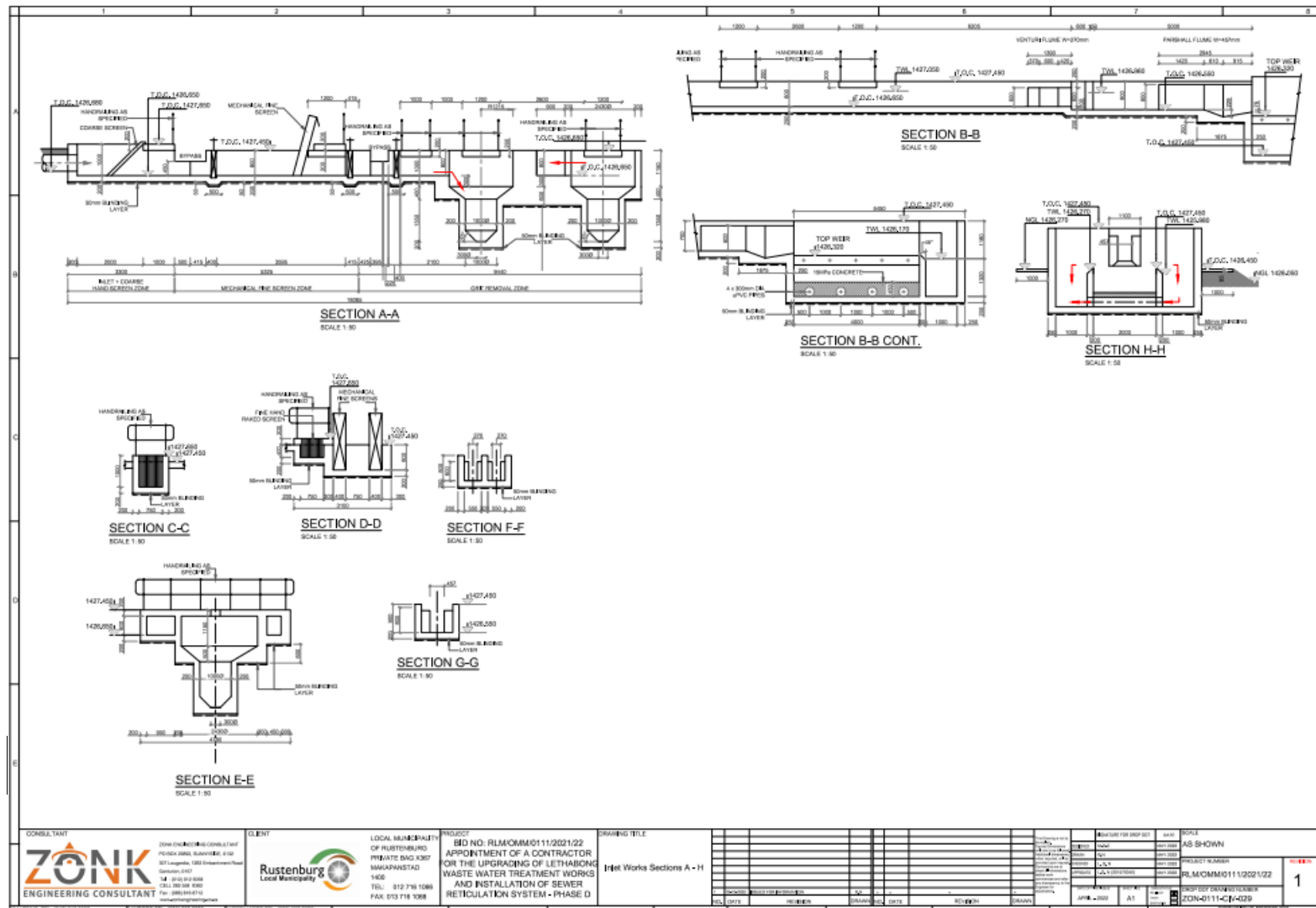




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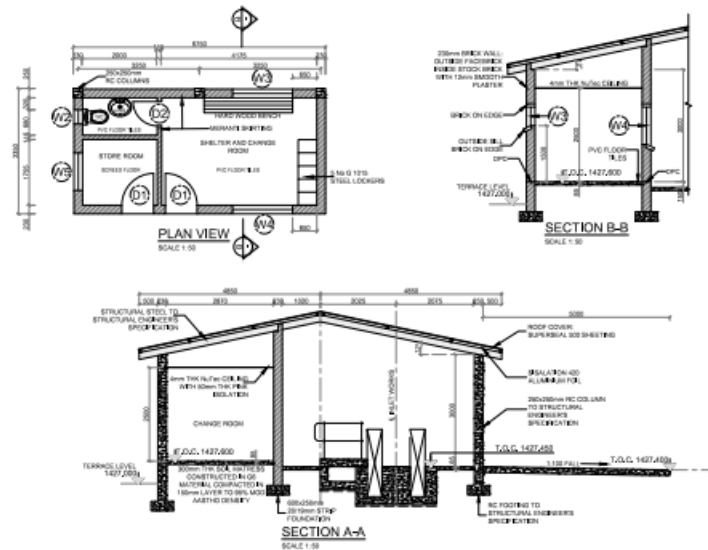




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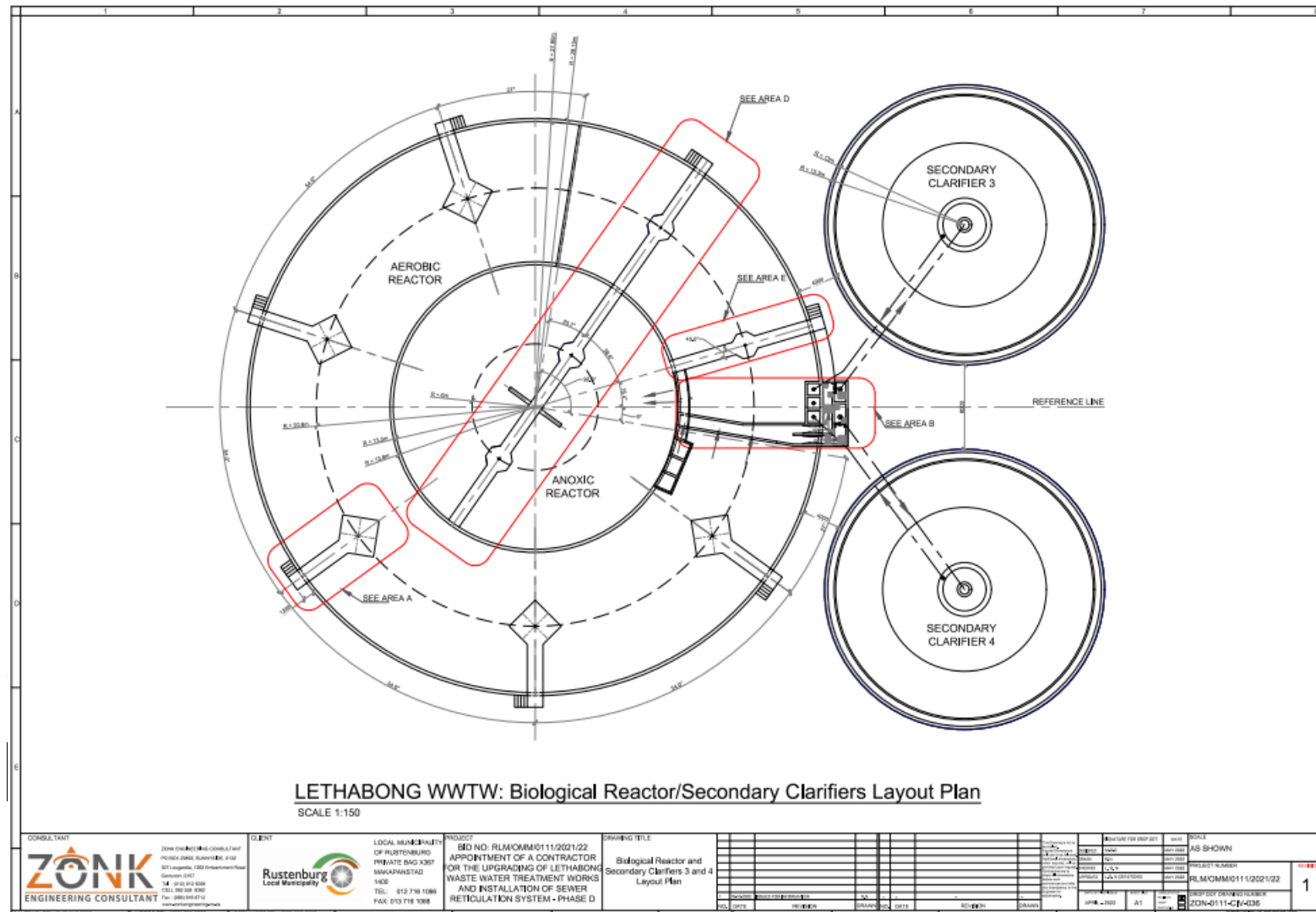
CONSULTANT  ZONK ENGINEERING CONSULTANT	CLIENT  Rustenburg Local Municipality	PROJECT BID NO: RLM/OMM/011/2021/22 APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTE WATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D	DRAWING TITLE Inlet Works Shelter and Store Room Building, Roof Covering	<table><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td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RUSTENBURG LOCAL MUNICIPALITY

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APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D

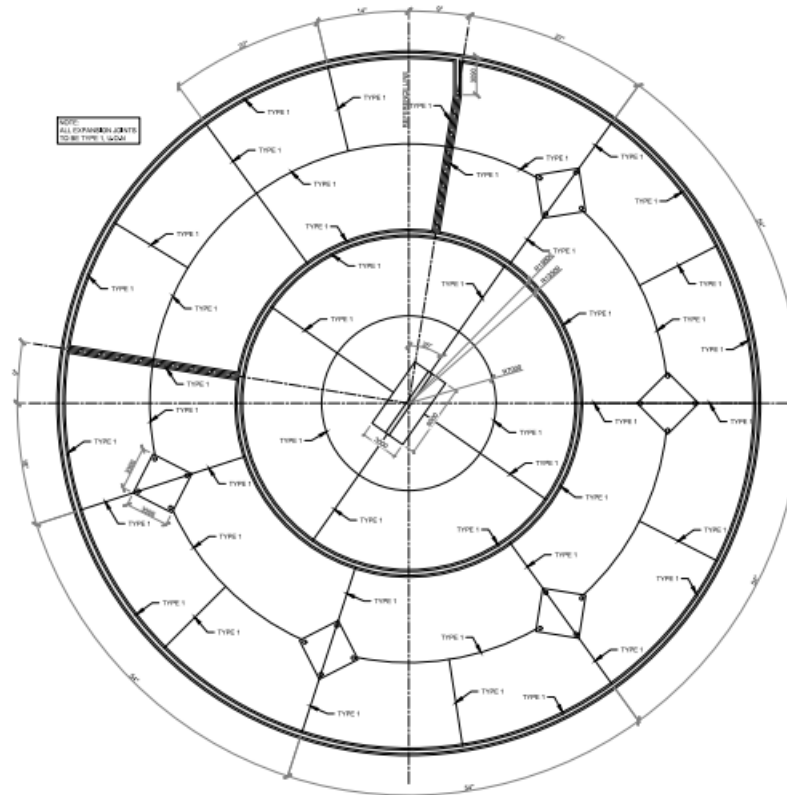




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BIOLOGICAL REACTOR - FLOOR + WALL JOINT LAYOUT PLAN
SCALE: 1:100

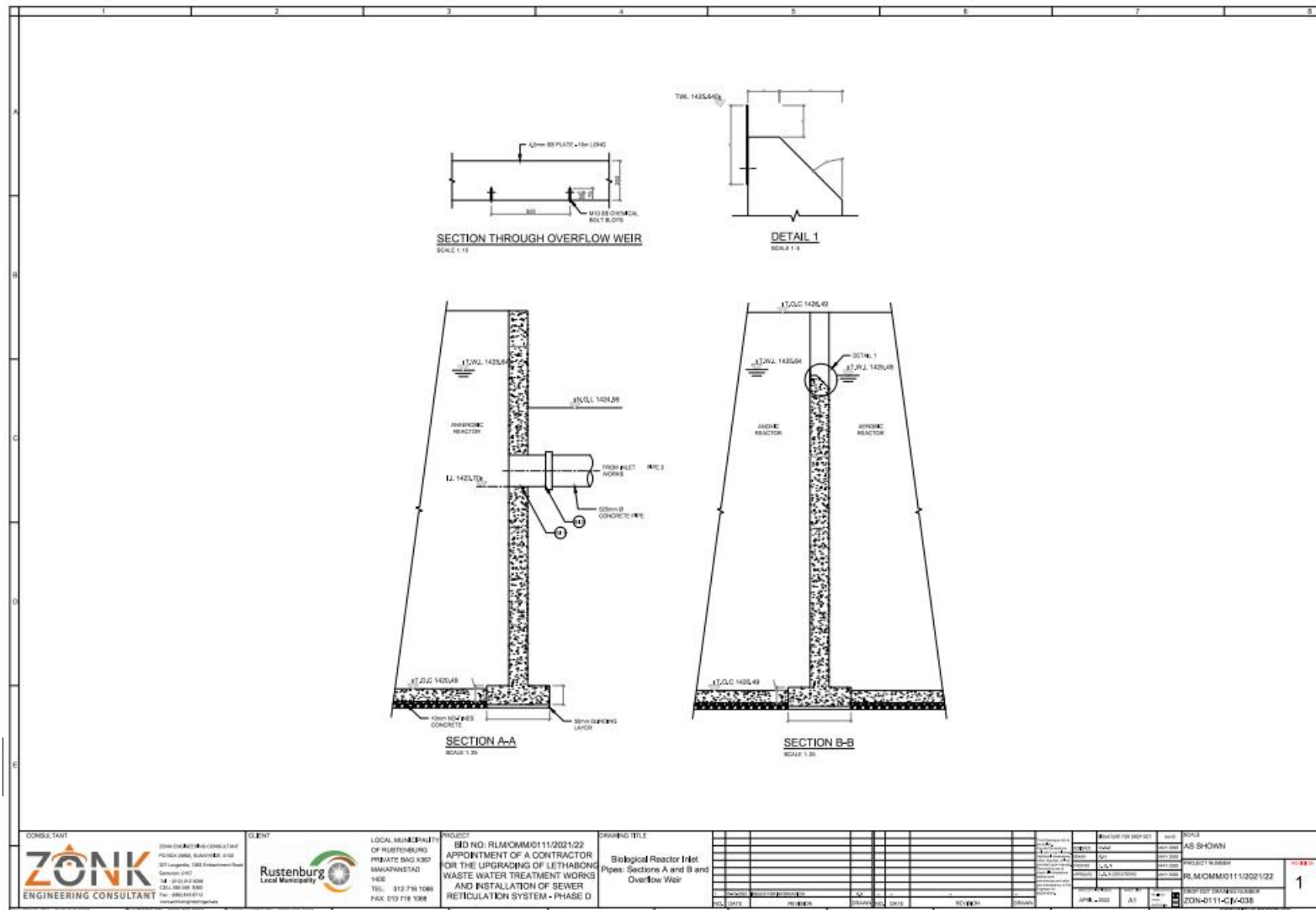
CONSULTANT ZONK ENGINEERING CONSULTANT 307 Lingsha, 1800 Embankment Road Grahamstown, 6102 Tel: 033 312 5050 Fax: 033 312 5050 Email: info@zonk.co.za	CLIENT LOCAL MUNICIPALITY OF RUSTENBURG PRIVATE BAG 3307 MAAPANATSTAD 1406 Tel: 012 719 1099 Fax: 012 719 1098	PROJECT BID NO: RLM/OMM/011/2021/22 APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTE WATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D	DRAWING TITLE Biological Reactor Floor and Wall Joint Connection Plan	<table border="1"> <tr> <th>NO.</th> <th>REVISION</th> <th>DATE</th> <th>BY</th> <th>CHECKED</th> <th>DATE</th> </tr> <tr> <td>1</td> <td>ISSUED FOR TENDERS</td> <td>2022/05/11</td> <td>MD/2022</td> <td>MD/2022</td> <td>2022/05/11</td> </tr> </table>	NO.	REVISION	DATE	BY	CHECKED	DATE	1	ISSUED FOR TENDERS	2022/05/11	MD/2022	MD/2022	2022/05/11	<table border="1"> <tr> <td colspan="2">APPROVED FOR TENDERS</td> <td colspan="2">DATE</td> </tr> <tr> <td></td> <td>MD/2022</td> <td>2022/05/11</td> <td></td> </tr> <tr> <td colspan="2">APPROVED FOR CONSTRUCTION</td> <td colspan="2">DATE</td> </tr> <tr> <td></td> <td>MD/2022</td> <td>2022/05/11</td> <td></td> </tr> </table>	APPROVED FOR TENDERS		DATE			MD/2022	2022/05/11		APPROVED FOR CONSTRUCTION		DATE			MD/2022	2022/05/11	
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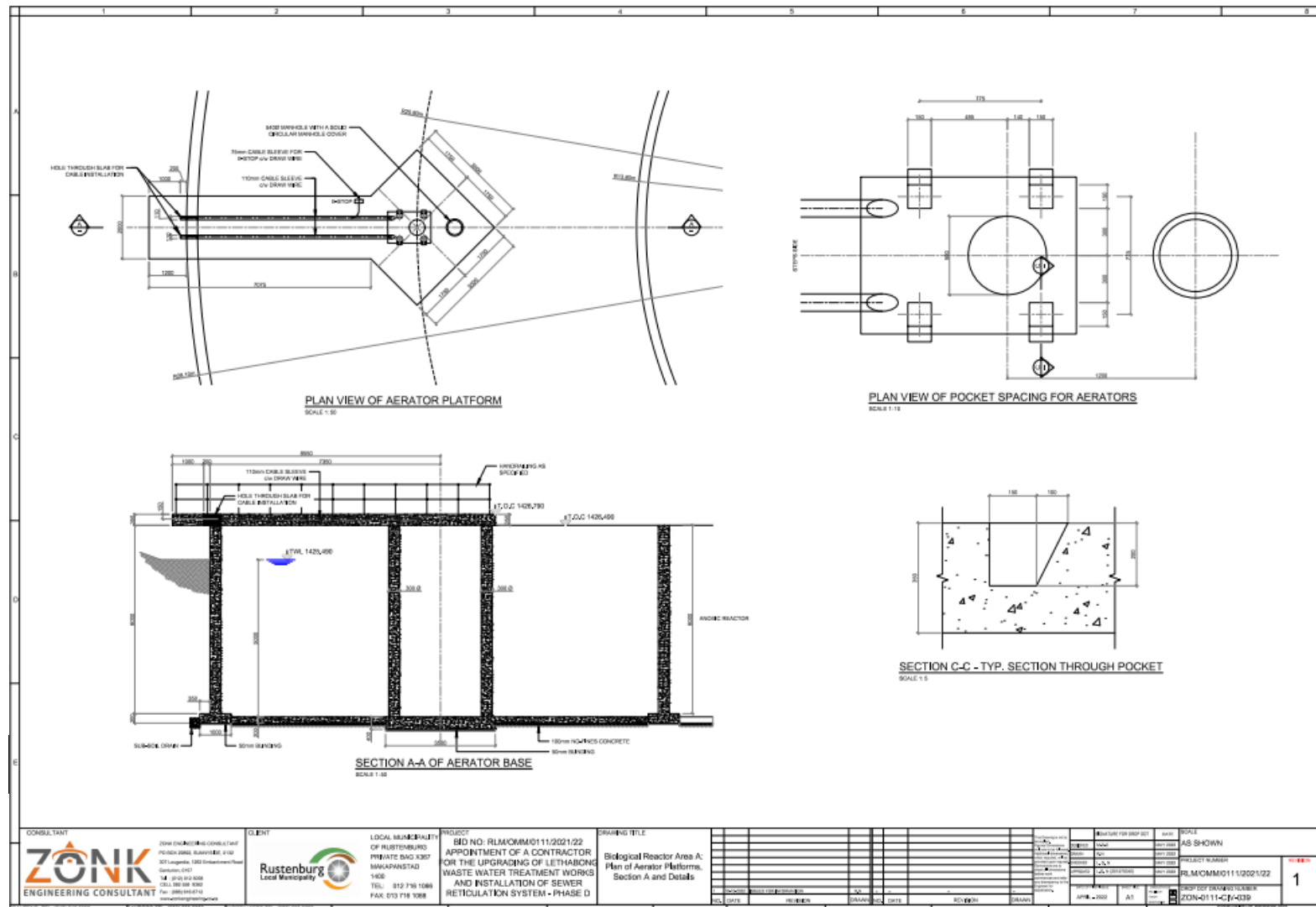




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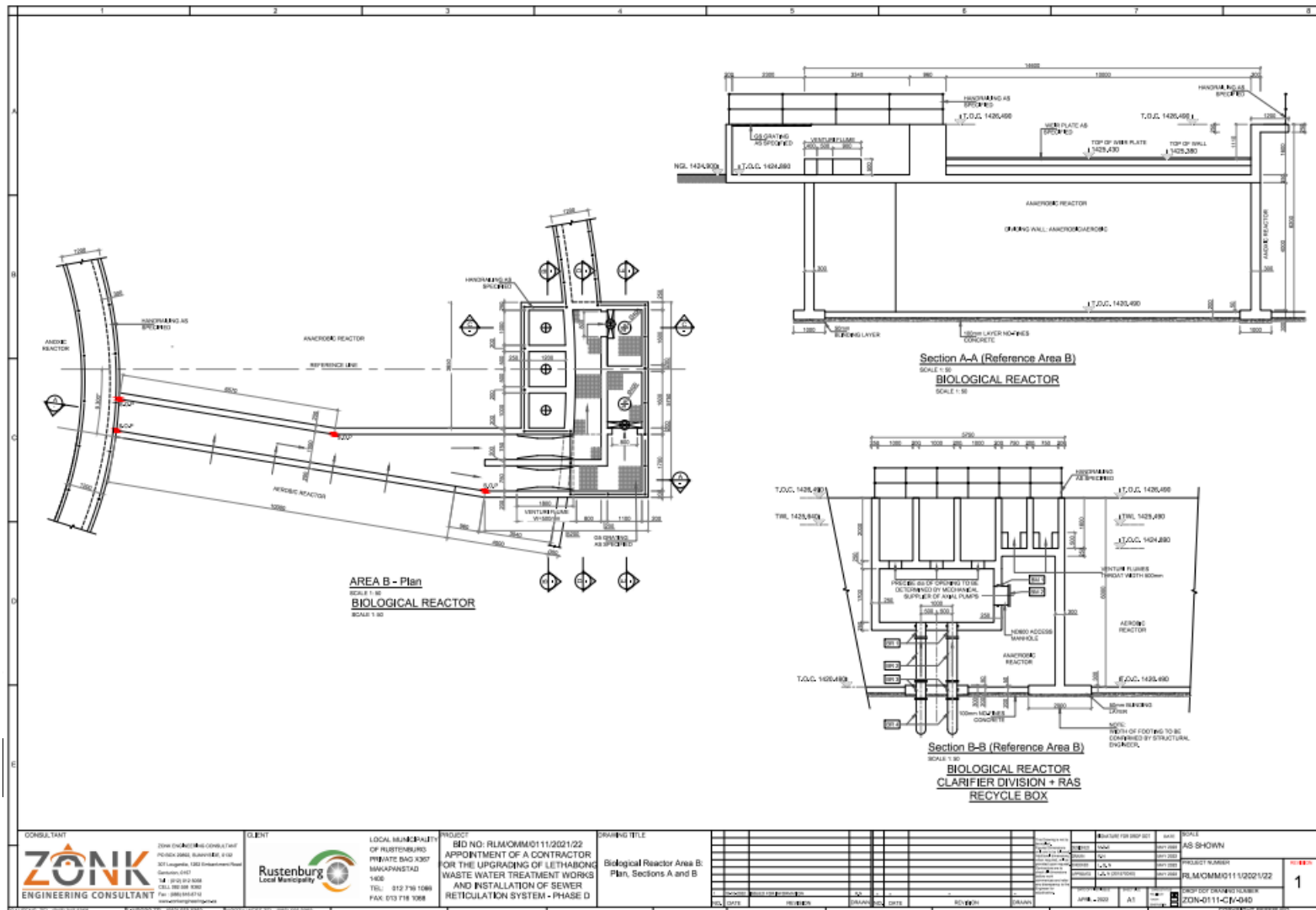




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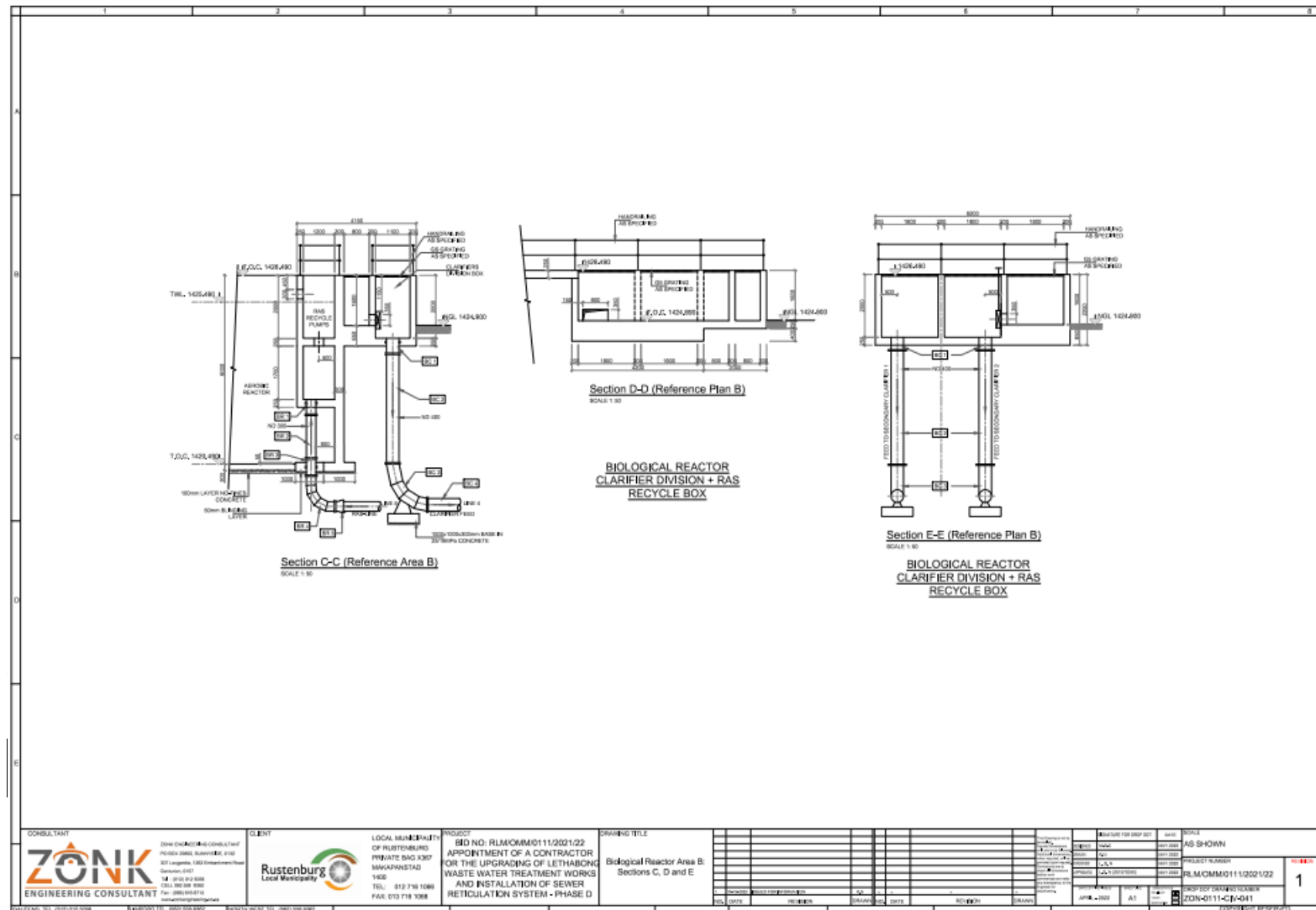
CONSULTANT ZONK ENGINEERING CONSULTANT 2004 CHURCH STREET, SUITE 101 301 LINDSAY, 3001 LINDSAY GERMISTON, 1601 TEL: 011 712 1000 CELL: 082 000 1000 FAX: 011 712 1000 zvonk@zonk.co.za	CLIENT Rustenburg Local Municipality 1400 TEL: 012 719 1000 FAX: 012 719 1000	PROJECT BID NO: RLM/OMM/011/2022/22 APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTE WATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D	DRAWING TITLE Biological Reactor Area B Plan, Sections A and B	<table border="1"> <tr> <th>NO.</th> <th>DATE</th> <th>DESCRIPTION</th> <th>BY</th> <th>CHKD</th> <th>APPD</th> </tr> <tr> <td>1</td> <td>2022/11/10</td> <td>ISSUED FOR TENDER</td> <td>...</td> <td>...</td> <td>...</td> </tr> </table>	NO.	DATE	DESCRIPTION	BY	CHKD	APPD	1	2022/11/10	ISSUED FOR TENDER	...	...	...	<table border="1"> <tr> <th>NO.</th> <th>DATE</th> <th>DESCRIPTION</th> <th>BY</th> <th>CHKD</th> <th>APPD</th> </tr> <tr> <td>1</td> <td>2022/11/10</td> <td>ISSUED FOR TENDER</td> <td>...</td> <td>...</td> <td>...</td> </tr> </table>	NO.	DATE	DESCRIPTION	BY	CHKD	APPD	1	2022/11/10	ISSUED FOR TENDER	...	...	...
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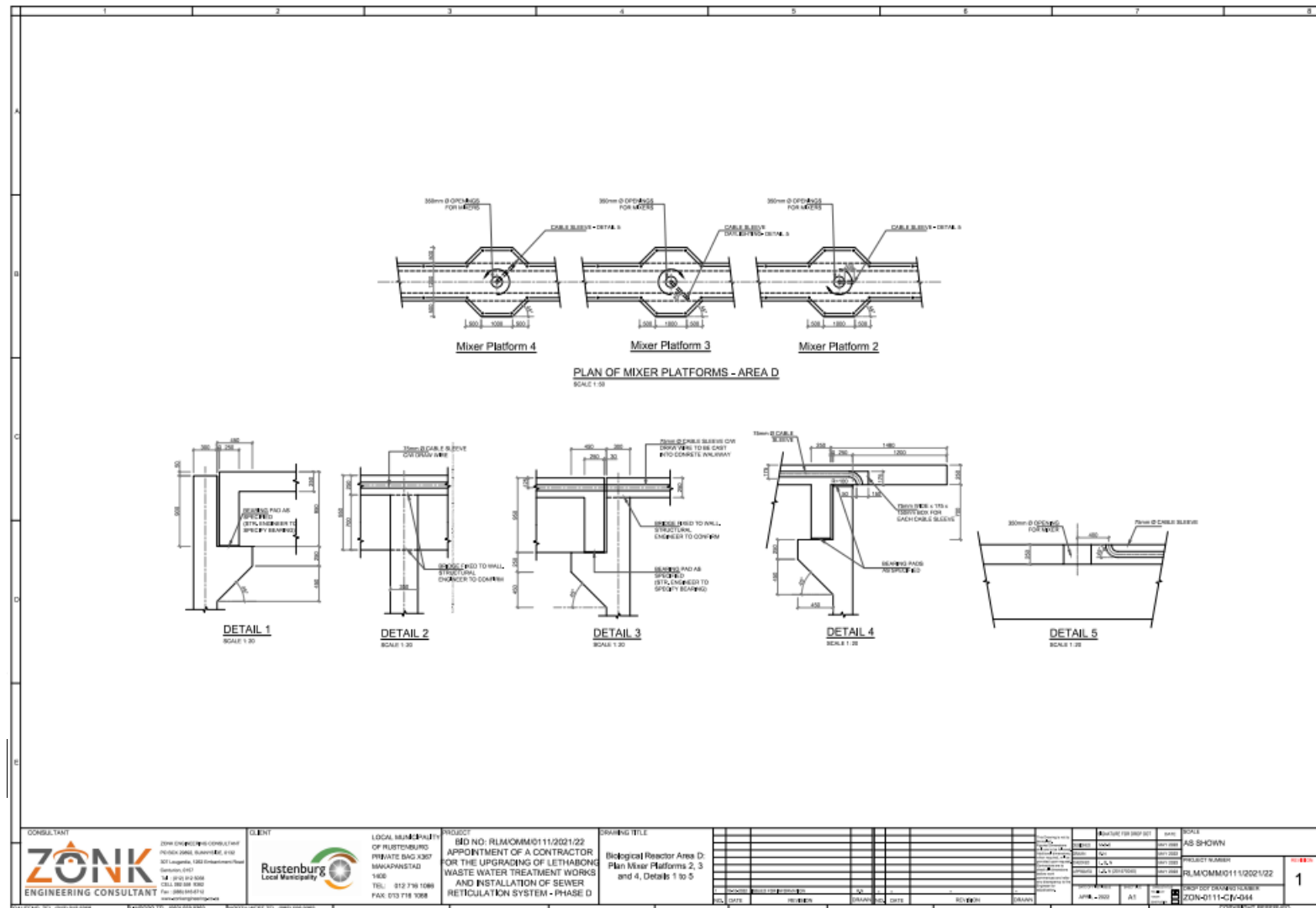




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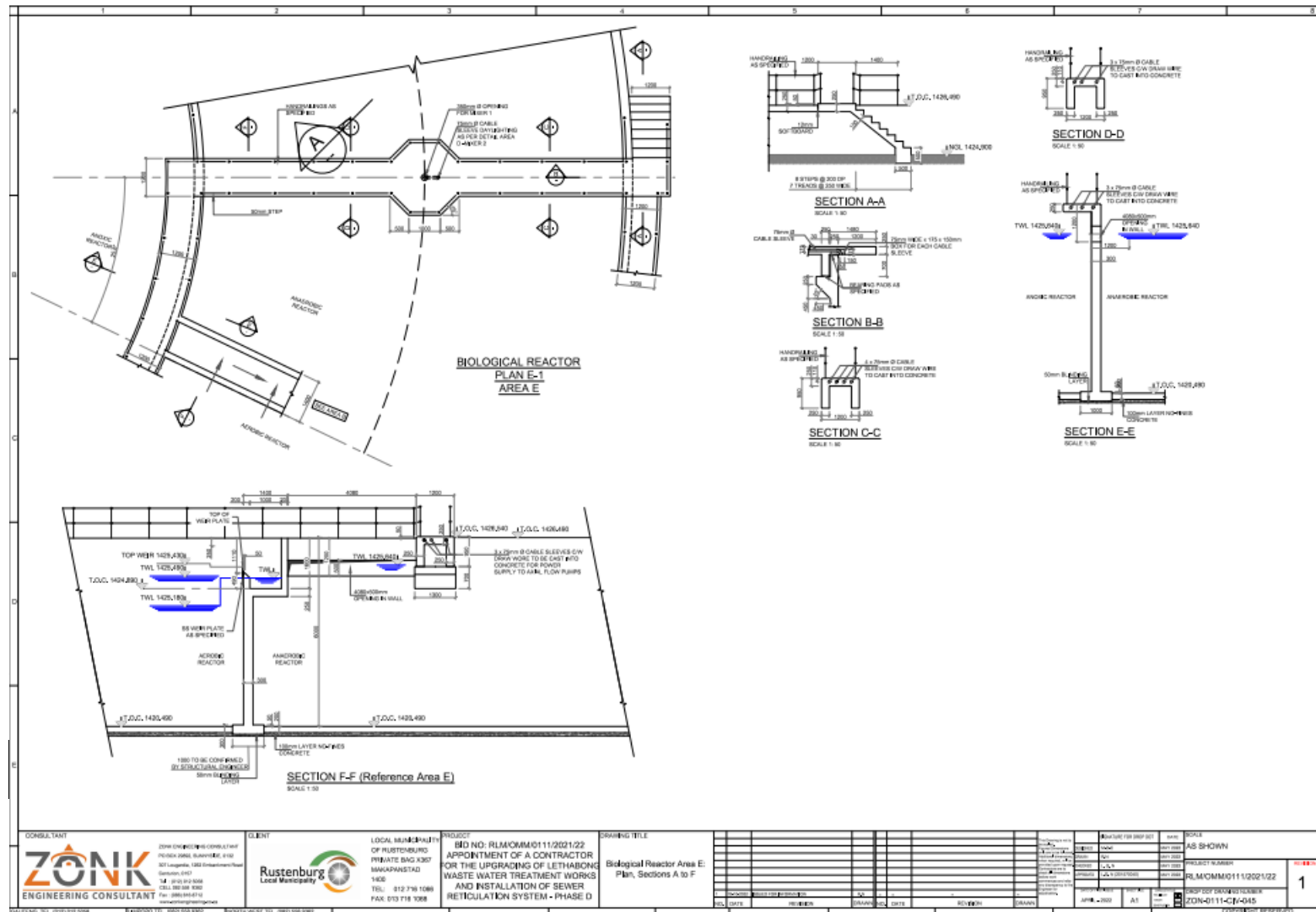




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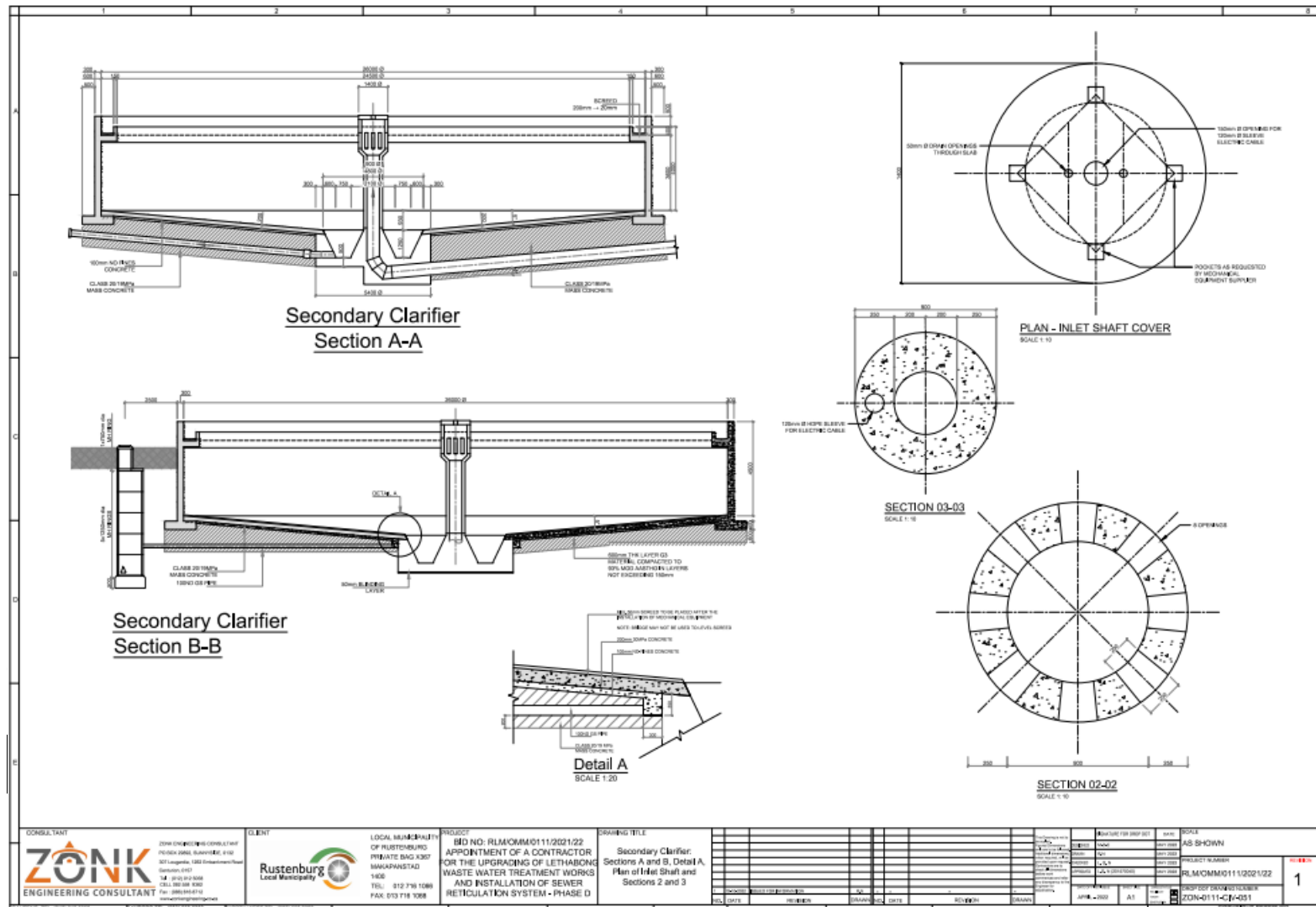
 ZONK ENGINEERING CONSULTANT	CLIENT  Rustenburg Local Municipality	LOCAL MUNICIPALITY OF RUSTENBURG PRIVATE BAG 4307 MAMPANATSI VES Tel: 072 776 1086 Fax: 072 776 3088	PROJECT RD NO. RLKOMM/011/2021/22 APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTE WATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D	DRAWING TITLE Secondary Clarifier 26m dia Floor Plan	DATE: 2021-04-01 BY: [Signature] CHECKED BY: [Signature] REVISION: SCALE: AS SHOWN PLOT NUMBER: ZON/011-CF-030	NO. 1 REVISED DATE 2021-04-01 REVISED BY [Signature] REVISED CHECKED BY [Signature] REVISED SCALE AS SHOWN REVISED PLOT NUMBER ZON/011-CF-030
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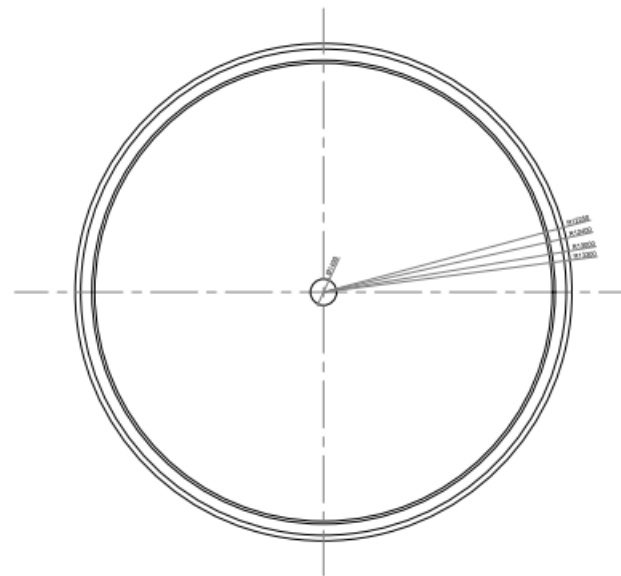




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APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTEWATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D



LETHABONG WWTW: Secondary Clarifier Top & Wall Level Plan

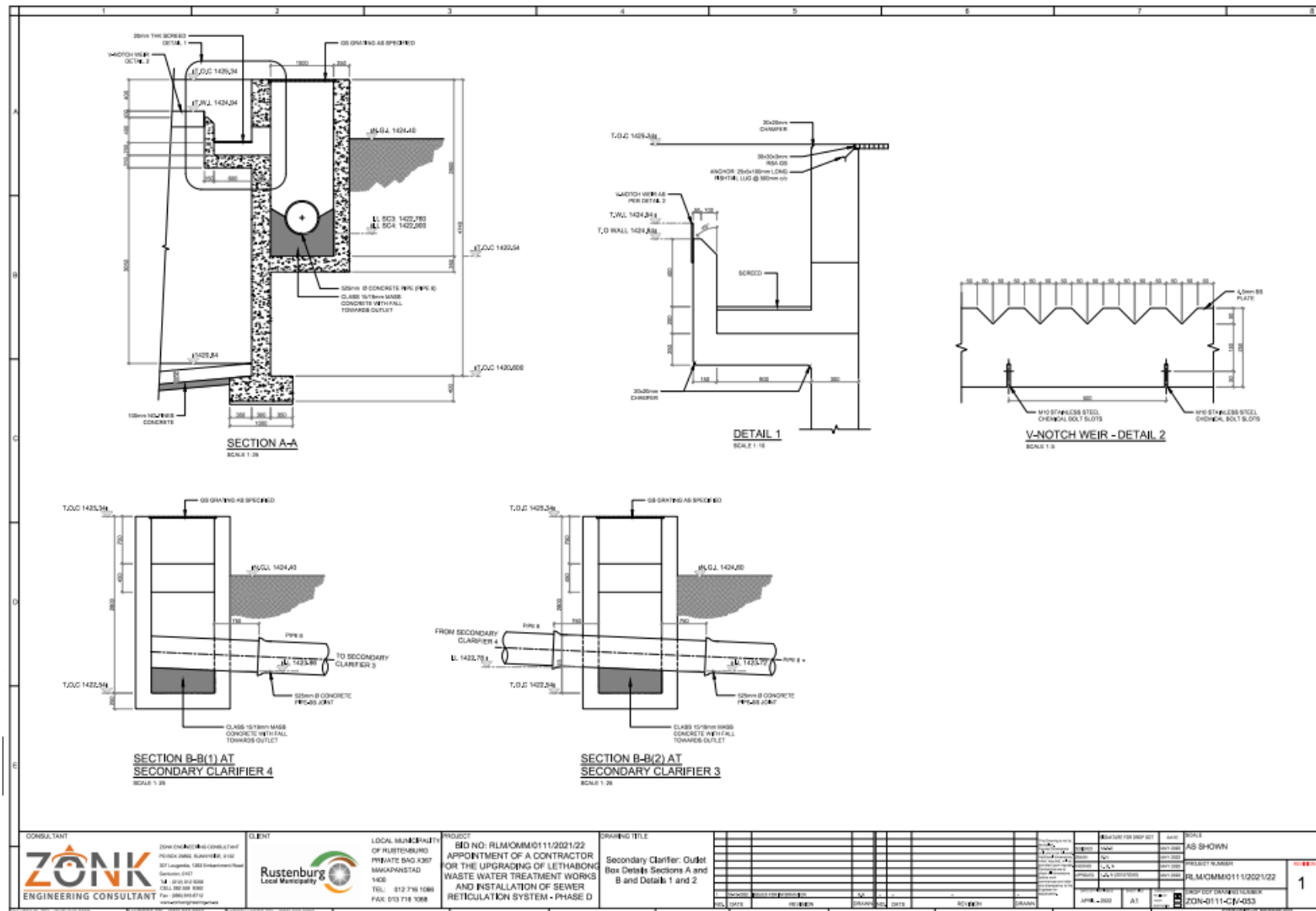
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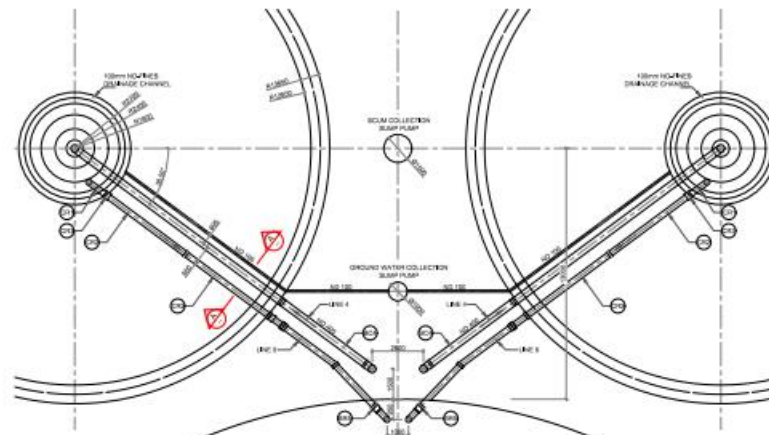




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LETHABONG WWTW: Secondary Clarifiers

Sub-Surface Pipe Layout Plan

SCALE: 1:100

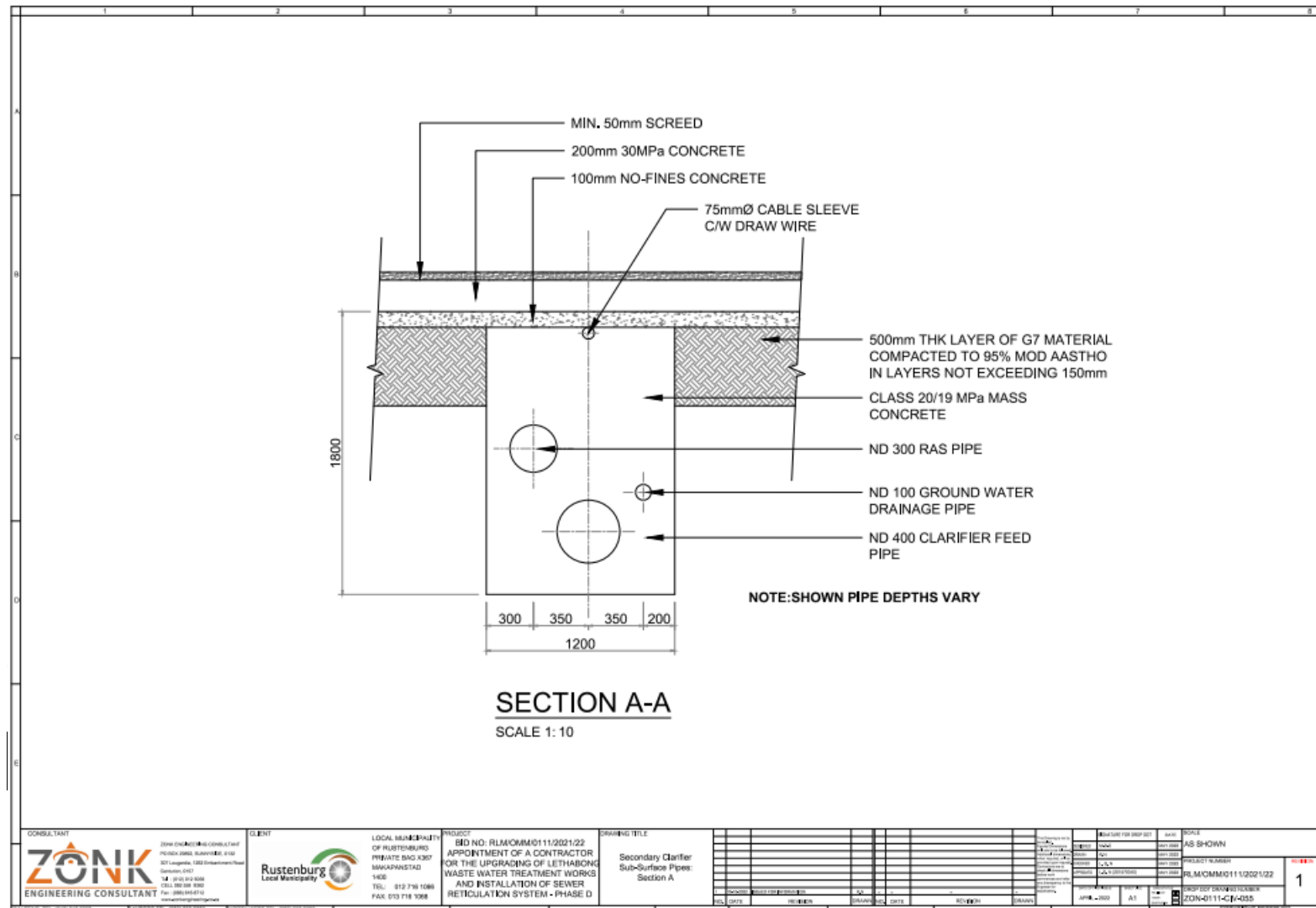
CONSULTANT ZONK ENGINEERING CONSULTANT 1014 CHURCH STREET, 3RD FLOOR RUSTENBURG, 5600 TEL: 012 512 5100 FAX: 012 512 5101 www.zonk.co.za	CLIENT Rustenburg Local Municipality 1014 CHURCH STREET, 3RD FLOOR RUSTENBURG, 5600 TEL: 012 512 5100 FAX: 012 512 5101 www.rustenburg.gov.za	PROJECT BID NO: RLM/OMM/011/2022/23 APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTE WATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D	DRAWING TITLE Secondary Clarifier Sub-Surface Pipes Layout Plan	<table border="1"> <tr> <th>NO.</th> <th>DATE</th> <th>REVISION</th> <th>BY</th> <th>CHKD</th> <th>APPD</th> </tr> <tr> <td>1</td> <td>2022/11/10</td> <td>1</td> <td>...</td> <td>...</td> <td>...</td> </tr> </table>	NO.	DATE	REVISION	BY	CHKD	APPD	1	2022/11/10	1	...	...	...	<table border="1"> <tr> <td>Author</td> <td>Drawn</td> <td>Scale</td> <td>AS SHOWN</td> </tr> <tr> <td>Checked</td> <td>Project</td> <td>Project Number</td> <td>RLM/OMM/011/2022/23</td> </tr> <tr> <td>Approved</td> <td>Project</td> <td>Project Name</td> <td>APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTE WATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D</td> </tr> <tr> <td>Drawn</td> <td>Project</td> <td>Project Number</td> <td>RLM/OMM/011/2022/23</td> </tr> <tr> <td>Checked</td> <td>Project</td> <td>Project Name</td> <td>APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTE WATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D</td> </tr> <tr> <td>Approved</td> <td>Project</td> <td>Project Number</td> <td>RLM/OMM/011/2022/23</td> </tr> </table>	Author	Drawn	Scale	AS SHOWN	Checked	Project	Project Number	RLM/OMM/011/2022/23	Approved	Project	Project Name	APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTE WATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D	Drawn	Project	Project Number	RLM/OMM/011/2022/23	Checked	Project	Project Name	APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTE WATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D	Approved	Project	Project Number	RLM/OMM/011/2022/23
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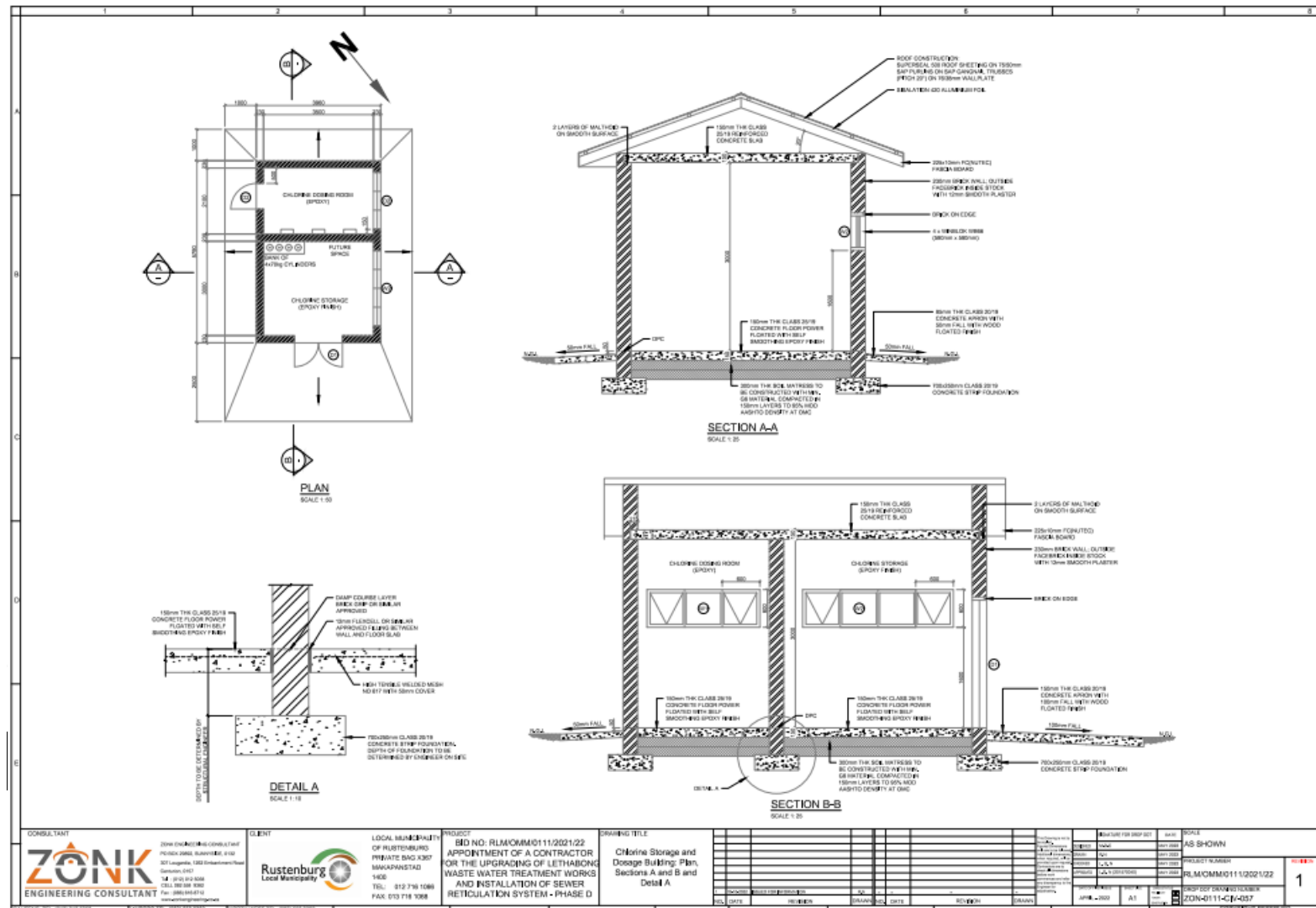




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TENDER DRAWINGS

724

Employer

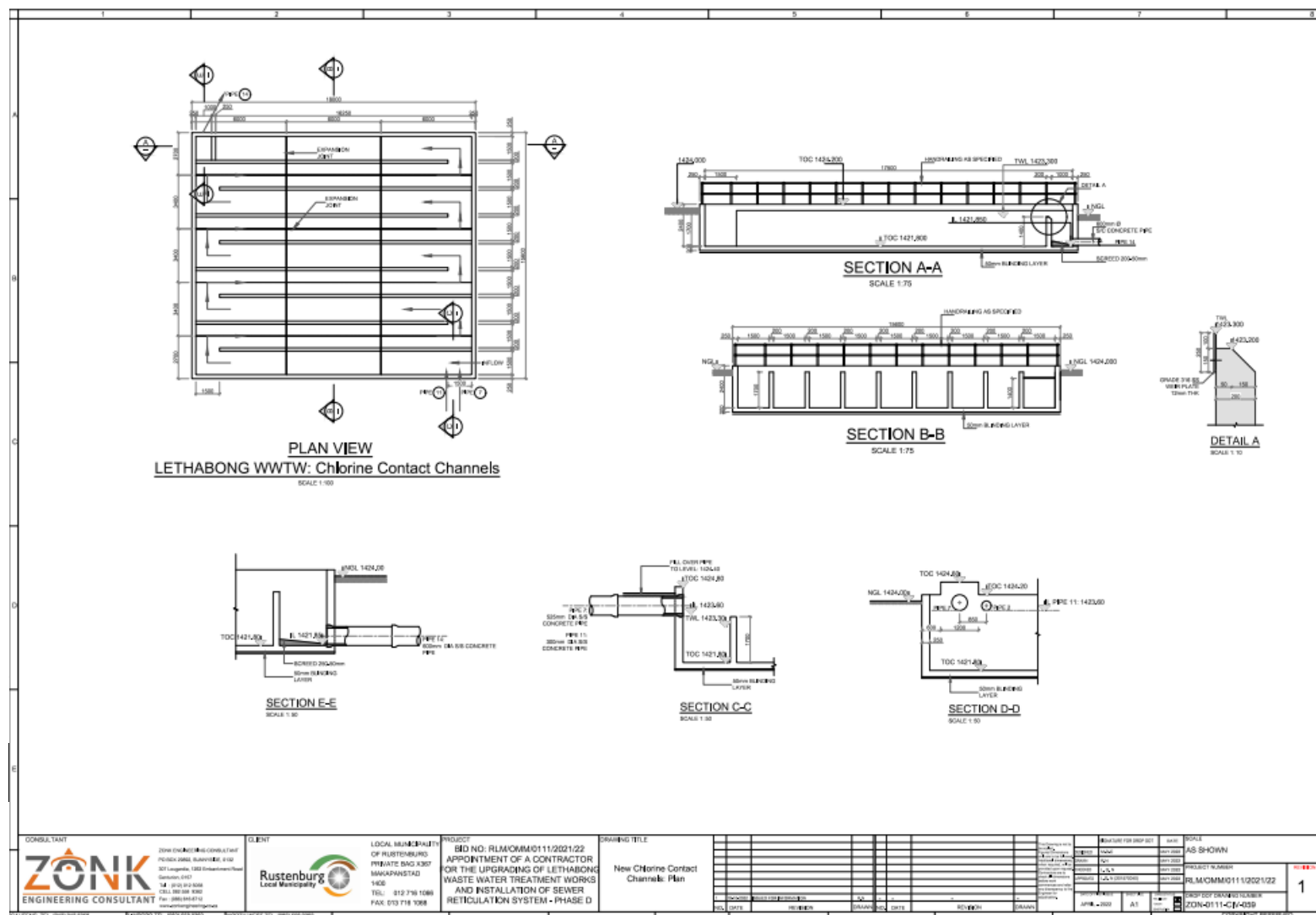
Witness 1

Witness 2

Contractor

Witness 1

Witness 2

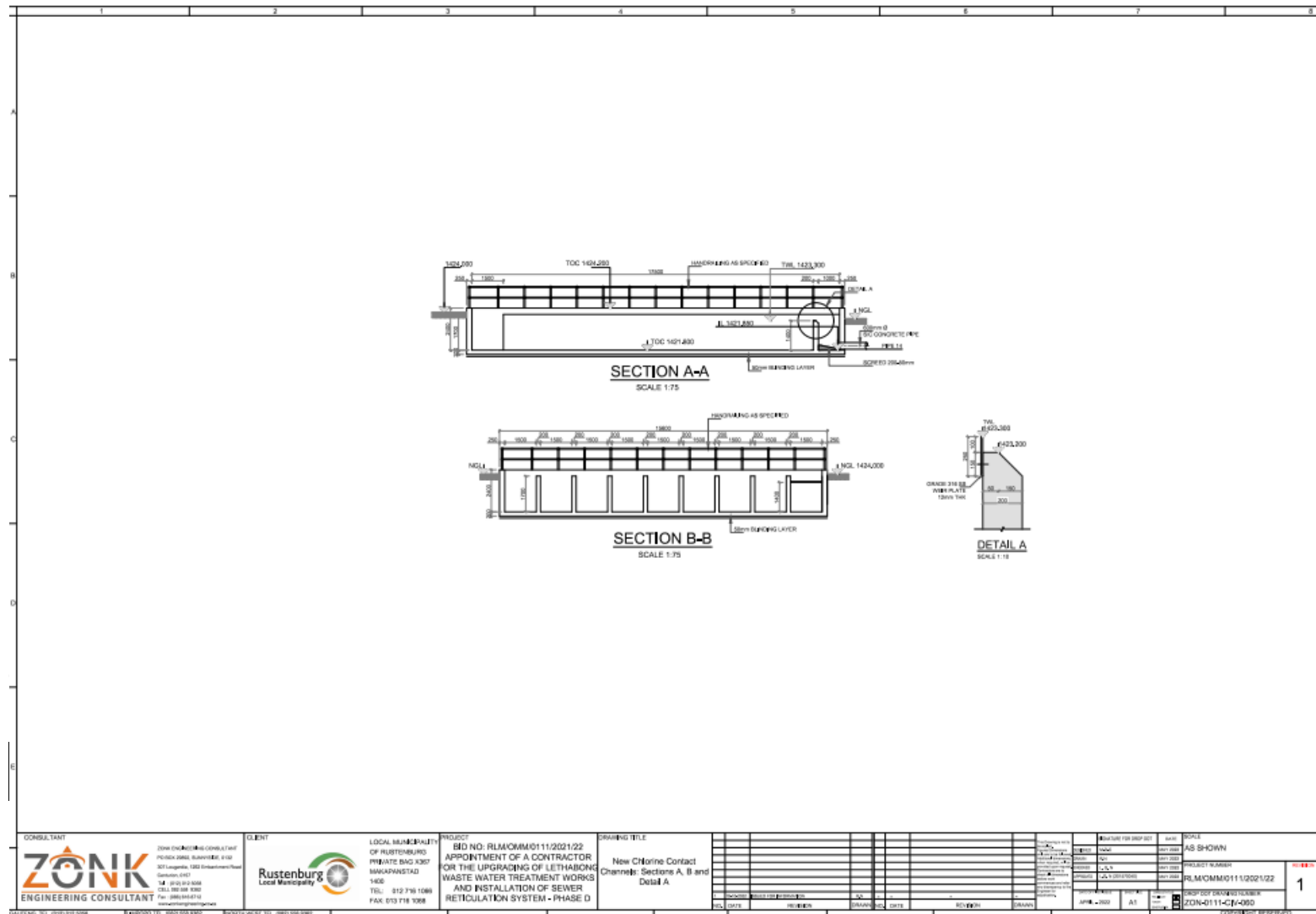




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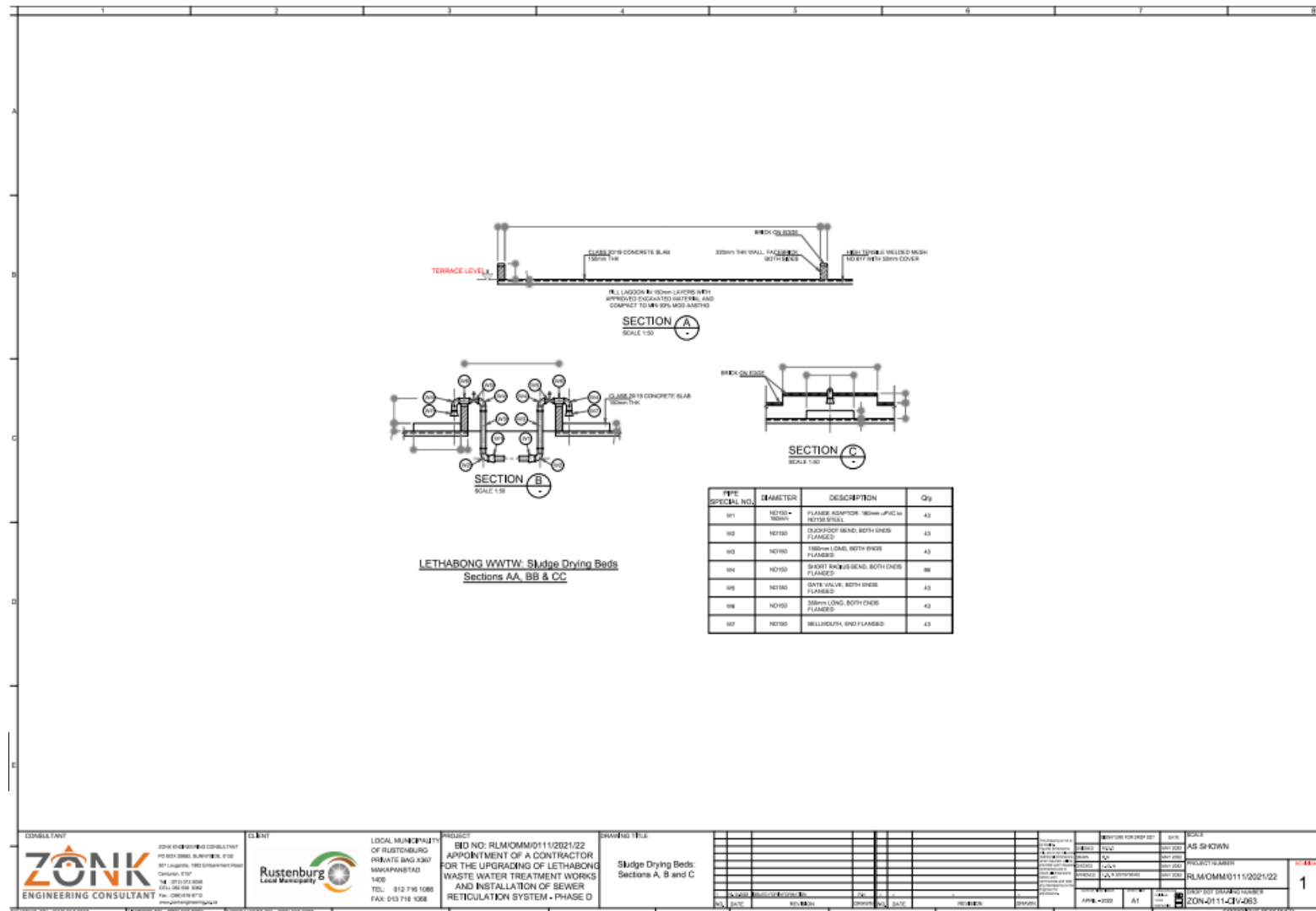
CONSULTANT  ZONK ENGINEERING CONSULTANT	CLIENT  Rustenburg Local Municipality	LOCAL MUNICIPALITY OF RUSTENBURG PRIVATE BAG 3087 MAMPOTENG 018 TEL: 018 312 3088 CELL: 082 688 4302 FAX: 018 312 3112 email: info@rmrustenb.co.za	PROJECT RD NO: RLM/00M/011/2021/22 APPOINTMENT OF A CONTRACTOR FOR THE UPGRADING OF LETHABONG WASTE WATER TREATMENT WORKS AND INSTALLATION OF SEWER RETICULATION SYSTEM - PHASE D	DRAWING TITLE Sudge Drying Beds North-Western Section Plan	<table border="1"> <tr> <th>NO.</th> <th>REV.</th> <th>DATE</th> <th>BY</th> <th>CHKD.</th> <th>DESCRIPTION</th> </tr> <tr> <td>1</td> <td>1</td> <td>2021/11/22</td> <td>SA</td> <td>SA</td> <td>ISSUED FOR TENDER</td> </tr> </table>	NO.	REV.	DATE	BY	CHKD.	DESCRIPTION	1	1	2021/11/22	SA	SA	ISSUED FOR TENDER	<table border="1"> <tr> <th>NO.</th> <th>REV.</th> <th>DATE</th> <th>BY</th> <th>CHKD.</th> <th>DESCRIPTION</th> </tr> <tr> <td>1</td> <td>1</td> <td>2021/11/22</td> <td>SA</td> <td>SA</td> <td>ISSUED FOR TENDER</td> </tr> </table>	NO.	REV.	DATE	BY	CHKD.	DESCRIPTION	1	1	2021/11/22	SA	SA	ISSUED FOR TENDER	<table border="1"> <tr> <th>NO.</th> <th>REV.</th> <th>DATE</th> <th>BY</th> <th>CHKD.</th> <th>DESCRIPTION</th> </tr> <tr> <td>1</td> <td>1</td> <td>2021/11/22</td> <td>SA</td> <td>SA</td> <td>ISSUED FOR TENDER</td> </tr> </table>	NO.	REV.	DATE	BY	CHKD.	DESCRIPTION	1	1	2021/11/22	SA	SA	ISSUED FOR TENDER
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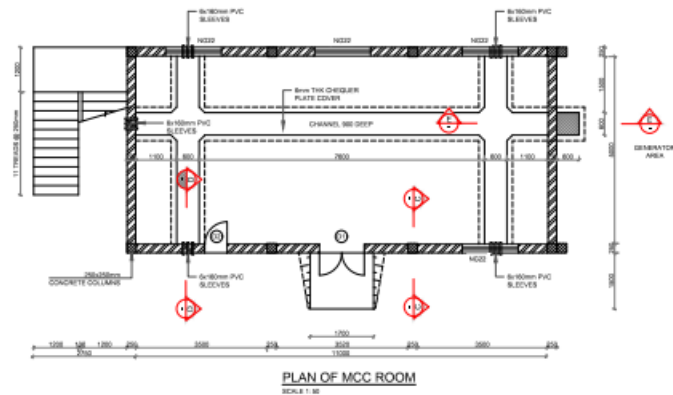




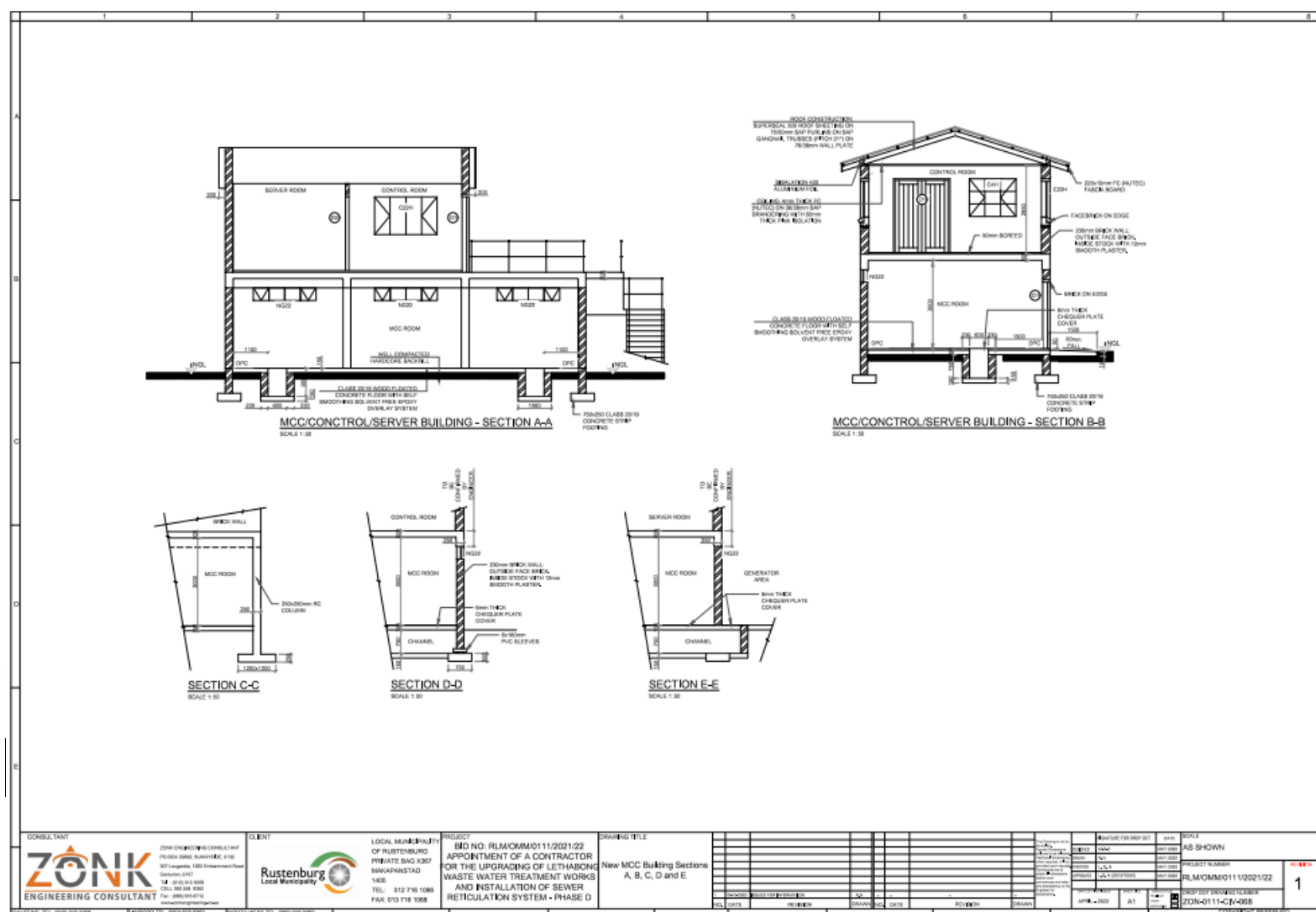
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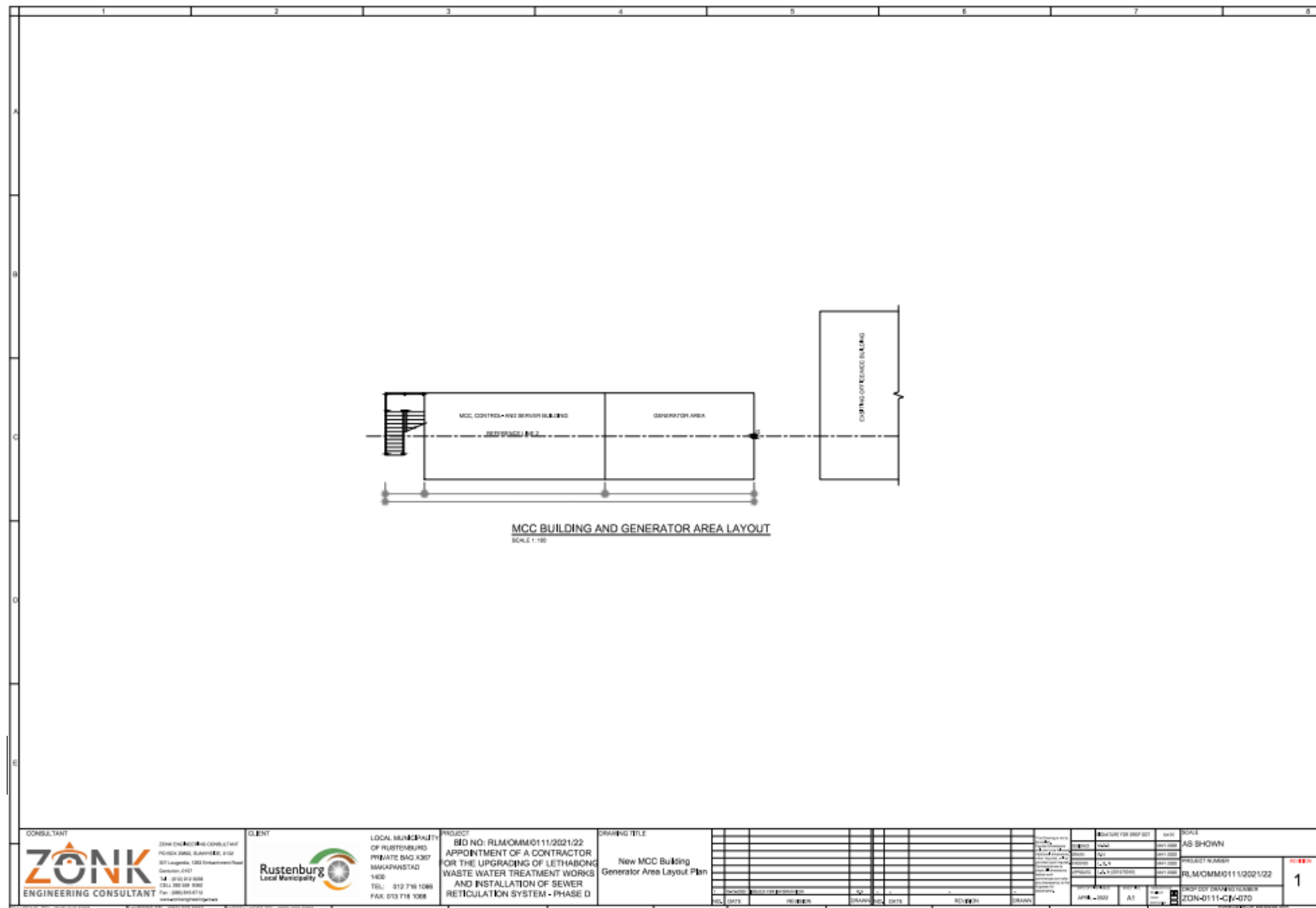




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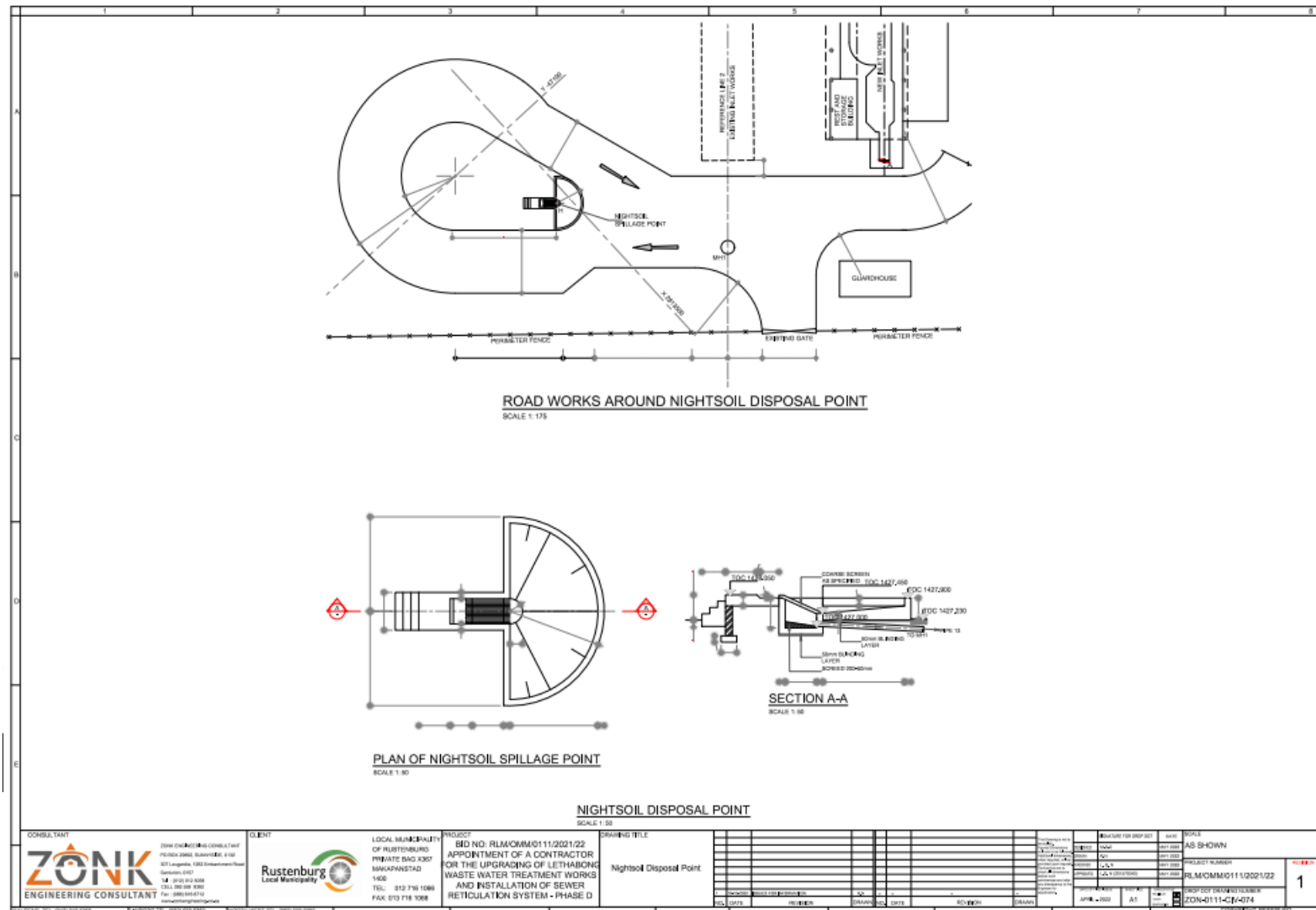
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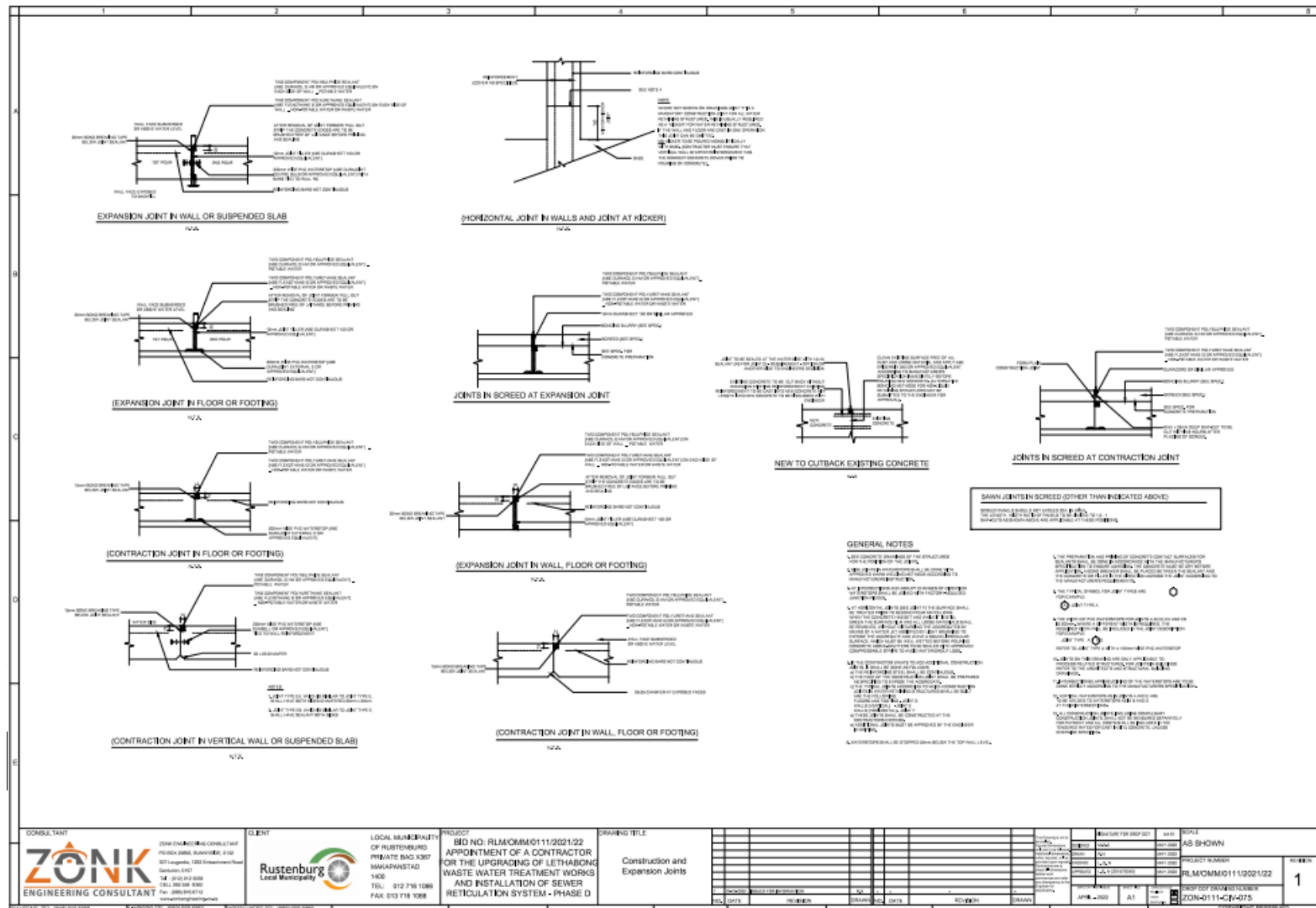




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