HARRY GWALA DISTRICT MUNICIPALITY

TENDER DOCUMENT FOR:
UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

CONTRACT NUMBER: HGDM902/HGDM/2026

TENDER AMOUNT IN RANDS:
……

TENDER AMOUNT IN WORDS:
……
……

The Municipal Manager
Harry Gwala District Municipality
40 Main Street
Ixopo
3276

Tel: 039 834 8700
Fax: 039 834 1701

NAME OF SERVICE COMPANY :

CONTACT PERSON :

TELEPHONE :

EMAIL :

ADDRESS :

CSD Registration Number: ……

SARS PIN ……

TENDER CLOSING DATE: FRIDAY, 11 DECEMBER 2026 @ 12H00

EXPANDED PUBLIC WORKS PROGRAMME
Creating opportunities towards human fullfilment

TENDER DOCUMENT CHECKLIST

Tenderers must complete this document checklist to ensure that all information is completed in the Tender Document.

ITEMS			CHECKED Tenderer
1)		Correct Tender Offer Amount carried forward to Cover Page and Form of Offe on Section C.1……..……....	
2)		All pages requiring signatures signed by the Tenderer ……	
3)		Bill of Quantities	
	i)	Completed in **BLACK INK** only …….....	
	ii)	Corrections crossed out and initialled…….……....	
4)		Submission of All Returnable Documents and Schedules	
	A	Authority for Signatory……...…….……...….....	
	B	MBD Forms…….…….…….	
	C	Schedule of work carried out by Tenderer…….....	
	D	Amendments, Qualifications and Alternatives….. …….....	
	E	Tax Clearance Certificate……. ……	
	F	Compulsory Enterprise Questionnaire…….…….....	
	G	Specific Goals…….. …….....….....	
	H	Key Personnel …….…….....	
	I	Contractor's Health and Safety Declaration…….....	
	J	Data to be provided by Tenderer……	

UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

CONTRACT NUMBER: HGDM902/HGDM/2026

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T1.2	Tender Data	Pink	TP 5
T2.1	Returnable Documents and Schedules	Yellow	RD 1
T2.2	List of Returnable Documents and Schedules	Yellow	RD 2 to RD 56
PART C1: AGREEMENTS AND CONTRACT DATA			**C 1 to C 18**
C1.1	Form Offer and Acceptance	Yellow	C 1
C1.2	Contract Data	Yellow	C 6
C1.3	Performance Guarantee	Yellow	C 11
C1.4	Disclosure Statement	Yellow	C 14
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C2.2	Schedule of Quantities	Yellow	PD 3
PART C3: SCOPE OF WORK			**SW 1 to SW 252**
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PART C4: SITE INFORMATION			**SI 1**
	Site Information	Green	SI 1
PART C5: DRAWINGS			**D1 to D2**
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CONTRACT NUMBER: HGDM902/HGDM/2026 -
UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

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PART T1: TENDERING PROCEDURES

T1.1: Tender Notice and Invitation to Tender

HARRY GWALA DISTRICT MUNICIPALITY
DEPARTMENT OF WATER AND SANITATION SERVICES

BID INVITATION

Bids are hereby invited from qualified and experienced Bidders for the supply and delivery of the following services for the Harry Gwala District Municipality.

PROJECT NAME	TENDER NUMBER	CIDB GRADING	COMPULSORY BRIEFING DATE	CLOSING DATE
UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)	HGDM902/HGDM/ 2026	7CE OR HIGHER	25 NOVEMBER 2026 AT 10:00AM AT UNDERBERG WASTEWATER TREATMENT WORKS SITE CO-ORDINATES (29°47'49.7"S 29°29'54.4"E). REFER TO SECTION PS-3: DESCRIPTION OF THE SITE AND ACCESS	11 DECEMBER 2026 AT 12H00

Invalid or non-submission of the following documents will lead to immediate disqualification.

Joint-Venture Agreement: Only Bidders that have the required CIDB Gradings listed on the table above will be considered. Joint ventures are also eligible to submit Bids provided that every member of the Joint Venture is registered with the CIDB, and a combined grade of Joint Venture calculated in accordance with the CIDB regulations is equal to or higher that the specified Contractor grading.

The following returnable documents must be submitted with the bid:

- Prices must be firm and must be inclusive of all applicable taxes.
- The following MBD forms must be submitted will all Bids (available on our website and reception) MBD 1, 3, 4, 8 and 9.
- A signed MBD 6.1 form must be completed to claim for preference points.
- A signed MBD 5 form must be completed and submitted together with audited financial statements for bids above R10 million.
- Service providers must quote as per specification required.
- All bids submitted shall be valid for 90 days after the tender closing date.

- Valid tax clearance certificate or SARS pin.
- Attach CSD report not older than 3- days.
- Your company must be registered on the municipal database and central supplier database.
- Municipal utility bill for municipal rates and services for all directors of the company (owners, shareholders. Executive directors / non-executive directors) and for the company to confirm that Municipal rates are not in arrears for more than 90 days.
    - Attach a valid lease agreement if the company is leasing the office space.
    - Attach a valid lease agreement if the director is leasing accommodation.
    - Attach affidavit if account is under parents, siblings, grandparents and you are not paying any Municipal rates.
    - Attach affidavit if the company is operating from the rural areas and is not liable for municipal rates
- The bid will be evaluated as follows:

First stage: Functionality

Second stage: Price and specific goals

The 80/20 preference point scoring system will apply:

Price **80 points**

Specific Goals **20 points**

SPECIFIC GOALS

PREFERENCE POINT SYSTEM DESCRIPTION		NUMBER OF POINTS		VERIFICATION METHOD
SPECIFIC GOALS				
Enterprise located within the Harry Gwala District Municipality.	**Locality Goals**	12	**12**	CIPC documents/ CSD Report / ID copies
Enterprise that located outside of the Harry Gwala District Municipality.		4		
Black Ownership ≥ 51%	**Ownership**	8	**8**	CIPC documents/ CSD Report / ID copies
Less than 51 % owned by black people		4		
Total Points			**20**	

NB: ALL SERVICE PROVIDERS ARE EXPECTED TO JOIN THE MEETING BY 10H00 AM, NO SERVICE PROVIDERS WILL BE ALLOWED TO JOIN THE MEETING AFTER 10:15 AM.

NB: ALL SERVICE PROVIDERS MUST HAVE THE FULL TENDER DOCUMENT PRINTED BEFORE JOINING THE BRIEFING MEETING.

COLLECTION OF BID DOCUMENTS

Bid documents may be collected from the **16 November 2026 between 09h00 to 16h00 at Harry Gwala District Municipality Offices**, **Finance Services Department, situated at Ixopo 40 Main Street, Ixopo 3276.** Tender documents for the will be issued upon a non-refundable cash payment of **R1000.00** each. Bid documents can also be downloaded on the municipal website: www.harrygwaladm.gov.za

CLOSING DATE

The closing date for the bids is as per the table above. Bids must be enclosed in **SEALED ENVELOPES** and clearly labelled with the **Tender Number and Project Name** on the outside of the envelope addressed to **The Municipal Manager.**

Bids must be deposited in the Bid Box at the Reception Area of **Harry Gwala District Municipal, 40 Main Street, IXOPO,** before the closing date and time. Telegraphic, telexed or faxed bids **WILL NOT** be considered, and late bids **WILL NOT** be accepted.

Harry Gwala District Municipality does not bind itself to accept the lowest or any Bid and reserves the right to accept the whole or any part of the bid.

BID ENQUIRIES

All bid enquiries and other matters shall be directed to: Executive Director: Water Services: Mr. L Gwala during working hours on Tel.:039-834 8700.

Personal information will be processed in accordance with POPIA and used only for purposes related top this tender.

Mr. GM. Sineke
Municipal Manager

T1.2: Tender Data

GENERAL

The Conditions of Tender applicable to this contract are the Standard Conditions of Tender as contained in Annexure F of the CIDB *Standard for Uniformity in Construction Procurement, including the amendment made through Board Notice 136 Government Gazette No 38960 of 10 July 2015*. This document is obtainable separately. Tenderers shall obtain their own copies.

The Tender Data make several references to the Standard Conditions of Tender for details that apply specifically to this tender. The Tender Data shall have preference in the interpretation of any ambiguity or inconsistency between it and the Standard Conditions of Tender.

Each item of Tender Data given below is cross-referenced to the relevant clause in the Standard Conditions of Tender to which it mainly applies. 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 Tender Data given below is cross-referenced to the relevant clause in the Standard Conditions of Tender.

Clause Number	Description
F.1	**GENERAL**
F.1.1.1	**Actions** The Employer for this Contract is: Name : Harry Gwala District Municipality Contact Name : Mr. Lindumusa Gwala Address : 40 Main Street Ixopo 3276 Private Bag X501, Ixopo 3276 Tel : 039 834 8700 Fax : 039 834 2259 E-mail address : gwalal@harrygwaladm.gov.za
F.1.2	**Tender Documents** (a)**The Tender Document**, issued by the Employer consists of the following: **THE TENDER** **T1: Tendering Procedures** T1.1: Tender Notice and Invitation to Tender T1.2: Tender Data **T2 : Returnable Documents** T2.1: List of Returnable Documents T2.2: Returnable Schedules and Documents **THE CONTRACT** **Part 1: Agreements and Contract Data** C1.1: Form of Offer and Acceptance C1.2: Pro-Forma Forms to be completed by successful tenderer only

	C1.3: Contract Data **Part 2: Pricing Data** C2.1: Pricing Instructions C2.2: Bill of Quantities **Part 3: Scope of Work** C3.1: Description of the Works C3.2: Engineering C3.3: Procurement C3.4: Construction Specifications **Part 4: Site Information** C4.1: Locality Plan **Part 5: Drawings** C5.1: Drawings
F.1.4	**Communication and Employer's Agent** **The Employer's Agent's (also referred to as the Engineer) details are as follows:**
	Name: DLV Project Managers & Engineers (Pty) Ltd Address: 13 Ennisdale Drive Durban North 4001 Tel Nº: 031 266 8345 Fax Nº: N/A Contact Person Suveer Rambali Email: suveer@dlveng.co.za
F1.5	**The Employers right to accept or reject any tender offer** The Employer is not obliged to accept the lowest or any tender offered
F.2	**TENDERER'S OBLIGATIONS**
F.2.1	**Eligibility** A Tenderer will only be eligible to submit a tender if he/she meets all of the following criteria: (a) Only those Tenderers who are registered with the CIDB, with a grading level of 7CE or higher, in a contractor as stated in the Tender Notice and Invitation to Tender determined in accordance with Regulations 25 (1B) or 25 (7A) of the Construction Industry Development Regulations, are eligible to have their tenders evaluated See Returnable Documents T2.2.1 FORM A. (b) 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 class of construction work as specified in the Invitation to Tender. 3. the combined contractor grading designation calculated in accordance with the Construction Industry Development Regulations is equal to or higher than the contractor grading designation required. (c) Only those tenderers who have in their employ management and supervisory staff satisfying the requirements of the scope of work for supervisory and management staff are eligible to submit tenders. (d) Tenderers are required to achieve the stipulated minimum thresholds, as per the relevant Treasury Instruction Note on local content and production. (See Returnable Documents T2.2.1 FORM J3)
F2.7	**Site visit and clarification meeting** The arrangements for the compulsory clarification meeting and site inspection are as stated in the Tender Notice and Invitation to Tender. Enquiries regarding the visit (at least one full working day in advance) may be directed to: **Contact Name: Mr Suveer Rambali (Consultant)** **Tel N°: 031 266 8345** **Cellular N°: 076 948 6473**
F.2.8	**Seek clarification** Working days shall be defined as Monday to Friday Inclusive and shall exclude all gazetted public holidays.
F.2.11	**Alterations to documents** A Tender offer shall not be considered if alterations have been made to the offer or contract data (unless such alterations have been duly authenticated by the Tenderer) or if any particulars required therein have not been completed in all respects. NB: In the event of a mistake having been made it shall be crossed out in ink and be accompanied by a full signature at each alteration. The municipality reserves the right to reject the tender if corrections are not made in accordance with the statement above. Usage of correction pen is not permitted, and the presence of correction fluid in the tender shall render the tender submission invalid.
F2.12	**Alternative tender offers** No Alternate Offers will be accepted
F.2.13	**Submitting a Tender Offer**
F.2.13.2	Tenderers to note that the returnable documents are listed in T.2 (Returnable Documents).

F.2.13.3	Under no circumstances whatsoever may the tender forms be retyped or redrafted. Tenderers are to note that no loose documents will be accepted. All returnable documents must be separately bound and labelled. *Tender offers shall be submitted as an original with one (1) copy. Where an original or certified copy of a particular returnable document is required, these shall be included as originals or certified copies, as appropriate in both the "original" and the "copy" documents.* The "Copy" document need not have copies of the entire document. Parts T2.2 (Returnable Schedules and Documents), C1.1 (Form of Offer and Acceptance), C1.2 (Contract Data) and C2.2 (Bill of Quantities) shall be submitted as the "Copy" document. Failure to submit a copy document will render the tender submission invalid.
F.2.13.5	Delivery of Tender The Employer's address for delivery of tender offers and identification details to be shown on each tender offer package are: **Location of tender box : Harry Gwala District Municipality Building** **Physical address : 40 Main Street, Ixopo** **Identification details : HGDM902/HGDM/2026: UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)** Under no circumstances must documents be handed to an employee of Harry Gwala District Municipality or handed in at the Procurement Department. Tender documents sent via courier services must also be deposited in the Tender Box and not handed to an employee of Harry Gwala District Municipality Late tenders and tenders not in the tender box at the time of opening will not be accepted by the District Municipality and will be returned to the applicant unopened. **NB: HGDM will not accept responsibility for tender documents which are not deposited in the Tender Box.**
	A two-envelope procedure will **NOT** be followed. (Read with F.3.5 hereafter).
F.2.13.9	Telephonic, telegraphic, telex, facsimile or e-mailed tender offers will not be accepted.
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.2.16.1	**Tender Offer Validity** The Tender Offer validity period is **90 days** from the closing time for submission of tenders.
F2.18	**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 together with satisfactory evidence that such staff members satisfy the eligibility criteria.

F.2.19	**Inspections, tests, and analyses** Access shall be provided for inspections and testing by personnel acting on behalf of the Employer, subject to prior arrangement.
F.2.20	**Sureties, Bonds and Policies** The Tenderer is required to submit with his Tender a letter of intent from an approved financial institution registered with the Financial Services Board undertaking to provide the PERFORMANCE GUARANTEE - DEMAND GUARANTEE to the format included in Part T2.2 of this procurement document.
F.2.22	**Return of Tender Documents** Where a tenderer who received a tender document does not submit a tender, the tender documents issued to him must be returned to the Employer within **35 days** after the closing date for submission of tenders.
F.2.23	**Certificates** The tenderer shall submit with his tender: Certificates as called for in Section T2 – Returnable Documents. Proof of qualifications and other documentation required shall only be accepted on the basis of originals and certified copies of certificates and other documents. Certificates as required in the Returnable Schedules and Forms must be provided with the tender for each party to a consortium / joint venture.
F.3	**THE EMPLOYER'S UNDERTAKINGS**
F3.1	**Respond to requests from the tenderer.** Working days shall be defined as Monday to Friday Inclusive and shall exclude all gazetted public holidays.
F.3.4	**Opening of Tender Submissions** Tenders will be opened immediately after closing time of tenders (see Tender Notice and Invitation to Tender) at the location of the tender box.
F3.5	**Two-envelope system** The two-envelope system will NOT be followed for this contract.
F3.8	**Test for Responsiveness** The minimum qualifying Functionality Evaluation Score shall be 65 (Sixty-five) points.
F.3.11	**Evaluation of Tender Offers** The procedure for the evaluation of responsive Tenders is **Method 2: Functionality, Price and Preference.**
F3.11.3	**Method 2: Functionality, Price and Preference** 1.1. The minimum points required for evaluation is 65 points.
F3.11.8	**Scoring preferences** Points for preference will be scored as set out in Returnable Documents T2.2.1 FORM M (MBD 6.1). The tenderer is to complete this Section to claim points for M**ethod 2: Functionality, Price and Preference**.

F3.11.9 **Scoring Functionality**

The table below lists the returnable schedules that set out the scoring criteria and sub-criteria, and the percentage weighting for the score achieved against the relevant schedule:

The financial offer will be scored using the following formula

80/20 preference points system for tenders for income-generating contracts with
Rand value equal to or below R50 million

Method 2: Functionality, Price and Preference

(a) Functionality

A maximum of 80 allocated for price on the following basis:

80/20 preference points system for tenders for income-generating contracts with a and value equal to or below R50 million

The following formula must be used to calculate the points for price in respect of an invitation for tender for income-generating contracts, with a Rand value equal to or below R50 million, inclusive of all applicable taxes

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

Where; Ps = Points scored for price of tender under consideration;
Pt = Price of tender under consideration; and
Pmax = Price of highest acceptable tender.

The quality will comprise scores for the following based on criteria indicated in the respective tender returnables and summarised as follows:

The score for quality can be further broken down per individual criteria as follows:

Description	Maximum Allocated Points
Experience of Bidder (Tenderer's Experience) in conducting work in water or wastewater treatment works	40
Experience of Key Personnel (Contracts Manager/Director)	5
Experience of Key Personnel (Site Agent)	5
Experience of Key Personnel (Foreman)	5
Financial Capacity	45
TOTAL MAXIMUM POINTS	**100**
TOTAL MINIMUM POINTS REQUIRED	**65**

Unless otherwise stated, evaluation criteria will be adjudicated with respect to the contract specific Scope of Work, as specified in C.3. In this regard the following definitions apply to the evaluation criteria:

- **"Tenderer's Experience in Water or Wastewater Treatment Works"** implies a project has been completed on time and to specification;
- **"Experience of Key Personnel"** implies experience on projects that had a comparable Scope of Work in terms of technical requirements; that involved the construction, testing, and commissioning of water and wastewater treatments works.
- **"Financial Capacity"** implies the Tenderer has sufficient financial resources, creditworthiness and cash-flow capability to mobilise, execute and complete the Works for the tendered amount.

Key Criteria Aspect	Basis for Points Allocation	Score	Max Score	Verification Method
Tenderers' Experience in Water or Wastewater Treatment Works	No information provided OR submission of no substance / irrelevant information provided.	0	40	Appointment letters and Completion Certificates (for subcontracting also attach appointment letter of main contractor) Refer to Form D.
	To have successfully completed 2-3 projects in Water or Wastewater Treatment Works	10		
	To have successfully completed 4 to 5 projects in Water or Wastewater Treatment Works	20		
	To have successfully completed 6 to 7 projects in Water or Wastewater Treatment Works	30		
	To have successfully completed 8+ projects in Water or Wastewater Treatment Works.	40		
Experience of Key Personnel (Contracts Manager/Director)	Degree/Diploma or higher qualification in Civil Engineering, professional registration with ECSA or SACPCMP and relevant experience in the position		5	Certified Copy of Qualification certificates, Certified Copy ID, Certified Copy of registration with appropriate council and Curriculum Vitae to be attached with traceable references. Experience must be on sanitation projects where he/she worked as a Contracts Manager.
	Less than 1 year of relevant experience in the position	0		
	1 to less than 3 years' relevant experience in the position	1		
	3 to less than 5 years' relevant experience in the position.	3		
	5 years or more of relevant experience in the position	5		

Key Criteria Aspect	Basis for Points Allocation	Score	Max Score	Verification Method
Experience of Key Personnel (Site Agent)	Relevant and accredited Degree/National Diploma, or equivalent qualification in Civil Engineering or Construction Management. Professional Registration with the Engineering Council of South Africa (ECSA) as a Pr Eng, Pr Tech, Pr Techni; or registration with SACPCMP as a Professional Construction Manager (Pr CM) or Professional Construction Project Manager (Pr CPM).		5	Certified Copy of Qualification certificates, Certified Copy ID, Certified Copy of registration with ECSA or SACPCMP and Curriculum Vitae to be attached with traceable references. Experience must be on sanitation projects.
	Less than 1 year of relevant experience in the position	0		
	1 to less than 3 years' relevant experience in the position	1		
	3 to less than 5 years' relevant experience in the position.	3		
	5 years or more of relevant experience in the position	5		
Experience of Key Personnel (Foreman)	Less than 1 year of relevant experience.	0	5	Curriculum Vitae to be attached with traceable references. Experience must be on civil engineering projects specifically sanitation.
	1 to less than 3 years' relevant experience in the position	1		
	3 to less than 7 years' relevant experience in the position	3		
	7 years or more relevant experience in the position	5		

Key Criteria Aspect	Basis for Points Allocation	Score	Max Score	Verification Method
Financial Capacity	Undoubted for the amount of your enquiry	A = 45	45	Rating by bank where account is held
	Good for tender amount quoted	B = 30		
	Average to good for the amount of tender enquiry, if strictly in the way of business	C = 15		
	Rating below good	D - F = 5		
	No bank rating submitted	0		

Tenderers that score less than 65 points of the total score allowed for functionality will not be considered for further evaluation.

The score allocated by each Bid Evaluation Committee member for a tender shall be the sum of the scores relevant to each of the above listed returnable schedules multiplied by the percentage weighting for each as shown above.

b) Financial Offer

The financial offer will be scored using the following formula

80/20 preference points system for tenders for income-generating contracts with
Rand value equal to or below R50 million

The following formula must be used to calculate the points for price in respect of an invitation for tender for income-generating contracts, with a Rand value equal to or below R50 million, inclusive of all applicable taxes.

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

Where; Ps = Points scored for price of tender under consideration;
Pt = Price of tender under consideration; and
Pmax = Price of highest acceptable tender.

(c) Preferences

Up to **20** points (for financial values up to R50 000 000) or **10** points (for financial values over R50 000 000) will be awarded to tenderers who are found to be eligible for the preference claimed.

Points will be awarded to Tenderers for attaining the Specific Goal of contribution as per the preferential procurement policy framework act, 2000: preferential procurement regulations, 2022 as detailed below.

SPECIFIC GOALS BREAKDOWN

PREFERENCE POINT SYSTEM DESCRIPTION		NUMBER OF POINTS		VERIFICATION METHOD
SPECIFIC GOALS				
Enterprise located within the Harry Gwala District Municipality	**Locality Goals**	12	12	CIPC documents/CSD Report / ID copies
Enterprise that is not located within the Harry Gwala District Municipality		4		
Black Ownership ≥ 51%	**Ownership**	8	8	CIPC documents/CSD Report / ID copies
Less than 51 % owned by black people		4		
Total Points			**20**	

F3.13	**Acceptance of Tender Offer**
F.3.13.1	Tender offers will only be accepted if: a) the tenderer has in his or her possession an original valid Tax Clearance Certificate or SARS Pin issued by the South African Revenue services or has made arrangements to meet outstanding tax obligations. b) the tenderer is registered with the Construction Industry Development Board in an appropriate contractor grading designation, by tender closing date; c) the tenderer is not in arrears for more than 3 months with the municipal rates and taxes and municipal services charges. d) the tenderer or any of its directors is not listed on the Register of Tender Defaulters in terms of the Prevention and Combating of Corrupt Activities Act of 2004 as a person prohibited from doing business with the public sector. e) the tender has not i) abused the Employer's Supply Chain Management System; or ii) failed to perform on any previous contract and has been given a written notice to this effect; and f) has completed the Compulsory Enterprise Questionnaires and there are no conflicts of interest which may impact on the tenderer's ability to perform the contract in the best interest of the employer or potentially compromise the tender process. g) the Tenderer or a competent authorized representative of the Contractor who submitted the tender has attended the compulsory clarification meeting and/or site inspection, as specified; h) the tender offer is signed by a person authorized to sign on behalf of the Tenderer; i) a Tenderer who submitted a tender as a Joint Venture has included an acceptable Joint Venture Agreement with his tender.
F.3.17	**Provide Copies of the Contract** The number of paper copies of the signed contract to be provided by the Employer is: **one.**
F3.20	**Mandatory Sub-Contracting.** The successful tenderer will be required to subcontract a portion of the works to designated groups as per the contract data.

APPENDIX: STANDARD CONDITIONS OF TENDER

(These Standard Conditions of Tender have been reproduced, without any changes, from Appendix A of the CIDB Standardized Construction Procurement Documentation for Engineering Construction Works (5 August 2005)

F.1 General

F.1.1 Actions

F1.1.1. 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.

F1.1.2. 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 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 the 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 decision 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 for the calling for expressions of interest, 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 interest 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

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 the factors of non-firm prices, all unconditional discounts and any other tendered parameters that will affect the value of the financial offer have been taken into consideration

(c) **corrupt practice** means the offering, giving, receiving or soliciting of anything of value to influence the action of the employer or his staff or agents in the tender process; 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) **Organisation** 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 read, copied and recorded. Writing 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 reasons for such action upon written request to do so.

F.1.5.2 The employer may not be subsequent to the cancellation or abandonment of a tender process, or the rejection of all tenders offers re-issue 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 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 positions of tenderers shall not apply.

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 data, shall be invited in each round to enter the 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 and 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 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 n 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 complies with 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 prior to do so prior to the closing time of tenders.

F.2.2 Cost of tendering

Accept that 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 satisfy requirements.

F.2.3 Check documents

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 Site visit and clarification meeting

Attend, where required, a site visit and 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) may 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.

F2.10.2 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

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

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. The alternative tender offer is to be submitted with the main tender offer together with a schedule that compares the requirements of the tender documents with the alternative requirements the tenderer proposes.

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 joint venture, to provide the whole of the works, services or supply identified in the contract data, 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 in black 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 shall 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 non-responsive.

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. Proof of posting shall not be

accepted as proof of delivery. The employer shall not accept tender offers submitted by telegraph, telex, facsimile or e-mail, unless stated otherwise in the tender data.

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.

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.

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

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 Respond to a request for clarification received up to five working days prior to 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 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 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 prequalification 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 of the Tender Notice until seven 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, will then notify it to 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 opening 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, the total of his prices, preferences claimed and time for completion, if any, 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.

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 above 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, on opening and before detailed evaluation, whether each tender offer properly received:

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

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,
- 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

F.3.9.1 Check responsive tender offers for arithmetical errors between amounts in words and amounts in figures. Where there is a discrepancy between the amounts in figures and 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 tenders in accordance with F.3.11 for:

a) The gross misplacement of the decimal point in the unit rate,
b) Omissions made in completing the pricing schedule or bills of quantities or
c) Arithmetic errors in

- Line-item totals resulting from the product of unit rate and a quantity in bills of quantities or schedule of prices; or
- The summation of the prices.

F3.9.2 Notify the tenderers of all errors or omissions that are identified in the tender offer and invite the tenderer to either confirm the tender offer as tendered or accept the corrected total of prices.

F.3.9.3 Where the tenderer elects to confirm the tender offer as tendered, correct the errors as follows:

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

Consider the rejection of a tender offer if the tenderer does not correct or accept the correction of his arithmetical errors in the manner described above.

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

F3.11.1 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 specific goals and associated evaluation criteria and weightings that are specified in the tender data.

F.3.11.2 Preference Goal 1: Ownership as specific goal

A maximum of 20 points (80/20 preference points system) or 10 (90/10) preference points system), may be allocated. Bidder may score preference points based on company ownership.

If the Municipality applies ownership as specific goal, the Municipality must advertise the tender with a specific tendering preferential procurement requirement that in order for a tenderer to claim 10 / 20 points for specific goals, bidder must have the following ownership structure:

- An EME or QSE
- an EME (exempted micro enterprise) or QSE (qualifying small business enterprise) which is at least 51% owned by black people.
- an EME (exempted micro enterprise) or QSE (qualifying small business enterprise) which is at least 51% owned by black people who are youth
- an EME (exempted micro enterprise) or QSE (qualifying small business enterprise) which is at least 51% owned by black people who are women
- an EME (exempted micro enterprise) or QSE (qualifying small business enterprise) which is at least 51% owned by black with disabilities
- a co-operative which is at least 51% owned by black people an EME (exempted micro enterprise) or QSE (qualifying small business enterprise) which is at least 51% owned by black people who are military veterans

Ownership verification may be conducted through the Companies and Intellectual Property Commission (CIPC).

F.3.11.3 Preference Goal 2: RDP Goals

The following activities may be regarded as a contribution towards achieving the goals of the RDP (published in Government Gazette No. 16085 dated 23 November 1994):

(a) The promotion of South African owned enterprises;
(b) The promotion of export orientated production to create jobs;
(c) The promotion of SMMEs;
(d) The creation of new jobs or the intensification of labour absorption;
(e) The promotion of enterprises located in a specific province for work to be done or services to be rendered in that province;
(f) The promotion of enterprises located in a specific region for work to be done or services to be rendered in that region;
(g) The promotion of enterprises located in a specific municipal area for work to be done or services to be rendered;
(h) The promotion of enterprises located in rural areas;
(i) The empowerment of the work force by standardising the level of skill and knowledge of workers;
(j) The development of human resources, including by assisting in tertiary and other advanced training programmes, in line with key indicators such as percentage of wage bill spent on education and training and improvement of management skills; and
(k) The upliftment of communities through, but not limited to, housing, transport, schools, infrastructure donations, and charity organisations

Address declared by the prospective bidder in the National Treasury Central Supplier Database (CSD) or in the Harry Gwala Municipal supplier database shall be used to determine the location of a business enterprise for the purposes of allocating preference points for (e), (f), (g) and (h) above.

F.3.11.4 Preference Goal 3: Combinations of any other Goals

The municipality may also combine any specific goals above in a manner that will help them evaluate and apply preference points to tenders

The municipality shall set appropriate Local Economic Development Targets in the form of Contract Participation Goals and or Targeted Procurement objectives which must form part of the invitation to tender, set as performance criteria within contracts.

F.3.11.5 Decimal places

Points scored must be rounded off to the nearest 2 decimal places.

F.3.11.6 Scoring Price

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

$N_{FO} = W_1 \times A$

where:
N_{FO} is the number of tender evaluation points awarded for price.
W_1 is the maximum possible number of tender evaluation points awarded for price 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 1[a]**	**Option 2 [a]**
1	Highest price or discount	$A = \left(1 + (P - Pm)\right)Pm$	$A = P \,/\, Pm$
2	Lowest price or percentage commission / fee	$A = (1 - (P - Pm))\, Pm$	$A = Pm \,/\, P$

[a] *P*m is the comparative offer of the most favourable comparative offer.
P is the comparative offer of the 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 functionality

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 x *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 risk and only if the tenderer:

a) is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement,
b) can, as 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,
c) has the legal capacity to enter into the contract,
d) is not insolvent, in receivership, under Business Rescue as provided for in chapter 6 of the Companies Act, 2008, 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,
e) complies with the legal requirements, if any, stated in the tender data, and
f) is able, in the opinion of the employer, to perform the contract free of conflicts of interest.

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:

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

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

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.

F3.19 Transparency in the procurement process

F3.19.1 The CIDB prescripts require that tenders must be advertised and be registered on the CIDB iTender system.

F3.19.2 The employer must adopt a transparency model that incorporates the disclosure and accountability as transparency requirements in the procurement process.

F3.19.3 The transparency model must identify the criteria for selection of projects, project information template and the threshold value of the projects to be disclosed in the public domain at various intervals of delivery of infrastructure projects.

F3.19.4 The client must publish the information on a quarterly basis which contains the following information:

- Procurement planning process
- Procurement method and evaluation process
- Contract type
- Contract status
- Number of firms tendering
- Cost estimate
- Contract title
- Contract firm(s)
- Contract price
- Contract scope of work
- Contract start date and duration
- Contract evaluation reports

F3.19.5 The employer must establish a Consultative Forum which will conduct a random audit in the implementation of the transparency requirements in the procurement process.

F3.19.6 Consultative Forum must be an independent structure from the bid committees.

F3.19.7 The information must be published on the employer's website.

F 3.19.8 Records of such disclosed information must be retained for audit purposes.

UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)
CONTRACT No. HGDM902/HGDM/2026

PART T2: RETURNABLE DOCUMENTS AND SCHEDULES

PART T2.1: LIST OF RETURNABLE DOCUMENTS AND SCHEDULES

1. List of Returnable Documents and Schedules Required for Tender Evaluation Purposes

- Registration on HGDM Supplier Database and CSD
- Declaration that supplier-database information
- Certificate of Tenderers' Attendance at the Clarification Meeting
- Authority for Signatory
- Schedule of Work Carried out by the Tenderer
- Certificate of Registration with CIDB
- Preliminary Programme
- Amendments, Qualifications and Alternatives
- SARS Pin
- Specific Goal Requirements
- Tenderer's Financial Standing
- Form of Intent to Provide a Performance Guarantee
- Compulsory Enterprise Questionnaire
- UIF Registration Certificate
- Proof of Purchase of Tender Documents
- MBD4 Form
- Joint Venture Disclosure Form
- Company Registration Certificate
- Identity Documents
- VAT Registration Certificate
- Copy of Cashed Cheque for Company
- Project Specific Health and Safety Plan
- Certificate of Municipal Services

2. Other Returnable Schedules and Documents that will be incorporated into the Contract

- Schedule of Construction Plant & Equipment
- Schedule of Proposed Sub-Contractors
- Record of Addenda to Tender Documents
- Rates for Special Materials
- Contractor's Health and Safety Declaration
- Form of Offer and Acceptance (Part C1)
- Contract Data (Part C1)
- Form of Guarantee (Part C1)
- Adjudicator's Agreement (Part C1)
- Agreement in Terms of the OHSA No 85 of 1993 (Part C1)
- Bill of Quantities (Part C2)
- Scope of Work (Part C3)
- Site information (Part C4)
- Drawings (Part C5)

REGISTRATION ON THE HARRY GWALA DISTRICT MUNICIPALITY SUPPLIERS DATABASE AND CENTRAL SUPPLIER DATABASE (CSD)

1. In terms of the Harry Gwala District Municipality Supply Chain Management Policy Framework, all suppliers of goods and services to the Municipality are required to register on the Municipal Suppliers Database. If the supplier is not registered at the closing time of bid, the supplier is required to submit a copy of the registration application form to supply chain management unit.

1.1. If you wish to apply for registration, forms may be downloaded from the website, **http://www.harrygwaladm.gov.za,** or obtained by collecting it in the offices of the Municipality (SCM).

2. Suppliers must be registered with the central supplier database in accordance with **National Treasury Instruction No. 4A of 2016/2017: Central Supplier Database**

3. If a business is registered on the Database and it is found subsequently that false or incorrect information has been supplied, then the Municipality may, without prejudice to any other legal rights or remedies it may;

3.1 De-register the supplier from the Database,

3.2 Cancel a Bid or a contract awarded to such supplier, and the supplier would become liable for any damages if a less favorable quotation is accepted, or less favorable arrangements are made.

4. Application for registration on to the municipality's supplier database must be submitted at Harry Gwala District Municipality (Supply Chain Management Unit).

5. IF THE SUPPLIER IS NOT REGISTERED AT THE CLOSING TIME OF BID, THE SUPPLIER IS REQUIRED TO SUBMIT A COPY OF THE REGISTRATION APPLICATION FORM TO SUPPLY CHAIN MANAGEMENT UNIT.

DECLARATION THAT INFORMATION ON HARRY GWALA DISTRICT MUNICIPALITY SUPPLIER DATABASE IS CORRECT AND UP TO DATE
(To be completed by bidder)

THIS IS TO CERTIFY THAT I (name of bidder/authorized representative)

……..……....., WHO REPRESENTS (state name

Of bidder)…….....…….

AM AWARE OF THE CONTENTS OF THE HARRY GWALA DISTRICT MUNICIPALITY SUPPLIER DATABASE WITH RESPECT TO THE SUPPLIER'S DETAILS AND REGISTRATION INFORMATION, AND THAT THE SAID INFORMATION IS CORRECT AND UP TO DATE AS ON THE DATE OF SUBMITTING THIS BID.

AND I AM AWARE THAT INCORRECT OR OUTDATED INFORMATION MAY BE A CAUSE FOR DISQUALIFICATION OF THIS BID FROM THE EVALUATION PROCESS, AND/OR POSSIBLE CANCELLATION OF THE CONTRACT THAT MAY BE AWARDED ON THE BASIS OF THIS BID.

.....
SIGNATURE OF BIDDER OR AUTHORISED REPRESENTATIVE

DATE: .....

FORM A: Certificate Of Attendance at Clarification Meeting

CONTRACT Nº HGDM902/HGDM/2026

UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

(Please print)

It is hereby CERTIFIED that I, …… *(name)*

in my capacity as…….and a duly authorized

representative of…… (the TENDERER)

of (address)…….

in the company of……(the ENGINEER)

attended the official Site Inspection on ……..(date)

for and on behalf of the above-named Tenderer.

I hereby further DECLARE that I am satisfied with the description of the Works and the explanations given by the above-named Engineer.

SIGNATURE .....
(On behalf of TENDERER)

DATE .....

AS WITNESS: -
(On behalf of ENGINEER)

NAME .....

SIGNATURE .....

DATE .....

NB: This to be completed and signed where briefing meeting was held.

FORM B: Authority for Signatory

Indicate the status of the tenderer by ticking the appropriate box hereunder. The tenderer must complete the certificate set out below for the relevant category.

A Company	B Partnership	C Joint Venture	D Sole Proprietor	E Close Corporation

A. Certificate for Company

I, ……....., chairperson of the board of …… , hereby confirm that by resolution of the board (copy attached) taken on …… 20….. , Mr/Ms ……..…….

acting in the capacity of …… , was authorised to sign all documents in connection with this tender for CONTRACT Nº HGDM902/HGDM/2026 and any contract resulting from it on behalf of the company.

As witnesses:

1. …….. Chairman: ……..

2. …….. Date: ……..

Signature of Authorised Person: ……

B. Certificate for Partnership

We, the undersigned, being the key partners in the business trading as …….

……..……....., hereby authorise

Mr/Ms …… ….....……, acting in the capacity of …….

……, to sign all documents in connection with this tender for

CONTRACT Nº HGDM902/HGDM/2026 and any contract resulting from it on our behalf.

Name	Address	Signature	Date

Note: This certificate is to be completed and signed by all key partners upon whom rests the direction of the affairs of the Partnership as a whole.

Signature of Authorised Person: ……

C. Certificate for Joint Venture

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 this tender for CONTRACT No. HGDM902/HGDM/2026 and any contract resulting from it on our behalf.

This authorisation is evidenced by the attached power of attorney signed by legally authorised signatories of all the partners to the Joint Venture.

Name of Firm	**Address**	**Authorising Name and Capacity**	**Authorising Signature**
Lead Partner:			

Signature of Authorised Person: ……

D. Certificate for Sole Proprietor

I, ……....., hereby confirm that I am

the sole owner of the business trading as …….

As witnesses:

1. …….. Sole Owner: ……..
2. …….. Date: ……..

Signature of Authorised Person: ……

E. Certificate for Close Corporation

We, the undersigned, being the members of the Close Corporation trading as ……..,
hereby authorise Mr/Ms ……, acting in the capacity of ……..., to sign all documents in connection with this tender for CONTRACT Nº HGDM902/HGDM/2026 and any contract resulting from it on our behalf.

Name	**Address**	**Signature**	**Date**

Note: This certificate is to be completed and signed by all key partners upon whom rests the direction of the affairs of the Partnership as a whole.

Signature of Authorised Person: ……

FORM C: Certificate of Registration with CIDB

The Tenderer is to attach a copy (ies) of Tenderer's Registration with CIDB or alternatively furnish the CIDB registration number and details in the table below. This information will be verified with the CIDB through the CIDB website. It is the Tenderer's responsibility to ensure that their details are displayed on the website. If a joint venture is tendering, details of all the JV members are to be furnished.

Name of Tenderer/Contractor	CIDB Registration Number	Category and Class of Registration e.g. 1CE

My/Our failure to submit the certificate(s) or furnish the required details with my/our tender document will lead to the conclusion that I/we are not registered with CIDB and therefore are not eligible to tender.

SIGNATURE: .....……..... DATE: .....
(of person authorised to sign on behalf of the Tenderer)

FORM D: Schedule of Work Carried out by the Tenderer

Refer to Scoring Functionality: F3.11.9 for Functionality Points evaluation prompts.

Tenderers are required to submit details of works of a similar nature to the scope of works executed within the past 10 years by myself / ourselves.

Tenderers are to submit copies of signed completion certificates for all projects submitted. This information is material to the award of the Contract.

EMPLOYER: CONTACT PERSON AND TELEPHONE NUMBER	CONSULTING ENGINEER: CONTACT PERSON AND TELEPHONE NUMBER	NATURE OF WORK	VALUE OF WORK (inclusive of VAT)	DATE COMPLETED

Tenderers are required to complete the Functionality Evaluation Criteria – Tenderer Self-Assessment table included in the table below.

FUNCTIONALITY EVALUATION CRITERIA – TENDERER SELF-ASSESSMENT				
Tenderers must select the applicable score for each criterion, insert their self-score, and provide the exact document/page reference for supporting evidence. Final scoring remains subject to evaluator verification.				
Key Criteria Aspect	**Basis for Points Allocation**	**Score**	**Max Score**	**Verification Method**
Tenderers' Experience in Water or Wastewater Treatment Works	No information provided OR submission of no substance / irrelevant information provided.	0	40	Appointment letters and Completion Certificates (for subcontracting also attach appointment letter of main contractor) Refer to Form D.
	To have successfully completed 2-3 projects in Water or Wastewater Treatment Works	10		
	To have successfully completed 4 to 5 projects in Water or Wastewater Treatment Works	20		
	To have successfully completed 6 to 7 projects in Water or Wastewater Treatment Works	30		
	To have successfully completed 8+ projects in Water or Wastewater Treatment Works.	40		

SIGNATURE: .....……..... DATE: .....
(of person authorised to sign on behalf of the Tenderer

FORM E: Preliminary Programme

The Tenderer shall detail below or attach a preliminary programme reflecting the proposed sequence and tempo of execution of the various activities comprising the work for this Contract. The programme shall be in accordance with the information supplied in the Contract, requirements of the Project Specifications and with all other aspects of his Tender.

PROGRAMME

ACTIVITY	WEEKS													

Attach additional pages if more space is required

[Note: The programme must be based on the completion time as specified in the Contract Data. No other completion time that may be indicated on this programme will be regarded as an alternative offer, unless it is listed in Table (b) of Form F hereafter and supported by a detailed statement to that effect, all as specified in the Tender Data]

SIGNATURE: .....……..…….. DATE: …….....
(of person authorised to sign on behalf of the Tenderer)

FORM F: Amendments, Qualifications and Alternatives

(This is not an invitation for amendments, deviations or alternatives but should the Tenderer desire to make any departures from the provisions of this contract he shall set out his proposals clearly hereunder. The Employer will not consider any amendment, alternative offers or discounts unless forms (a), (b) and (c) have been completed to the satisfaction of the Employer).

I / We herewith propose the amendments, alternatives and discounts as set out in the tables below:

(a) AMENDMENTS

PAGE, CLAUSE OR ITEM NO	PROPOSED AMENDMENT

Notes:

(1) Proposals for amendments to the General and Special Conditions of Contract are not acceptable, and will be ignored;

(2) The Tenderer must give full details of all the financial implications of the amendments and qualifications in a covering letter attached to his/her tender.

(b) ALTERNATIVES

PROPOSED ALTERNATIVE	DESCRIPTION OF ALTERNATIVE

Notes

(1) Individual alternative items that do not justify an alternative tender, and an alternative offer for time for completion should be listed here.

(2) In the case of a major alternative to any part of the work, a separate Bill of Quantities, programme, etc, and a detailed statement setting out the salient features of the proposed alternatives must accompany the tender.

(3) Alternative tenders involving technical modifications to the design of the works and methods of construction shall be treated separately from the main tender offer.

(c) DISCOUNTS

ITEM ON WHICH DISCOUNT IS OFFERED	DESCRIPTION OF DISCOUNT OFFERED

Note: The Tenderer must give full details of the discounts offered in a covering letter attached to his tender, failing which, the offer for a discount may have to be disregarded.

SIGNATURE: .....……..…….. DATE: .....
(of person authorised to sign on behalf of the Tenderer)

FORM G: SARS PIN

The Tenderer is to attach valid SARS Pin on this page. In the case of a Joint Venture, valid copies of SARS Pin for all members of the Joint Venture must be attach.

FORM H: Tenderer's Financial Standing

UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

Contract Number: HGDM902/HGDM/2026

The Employer may make inquiries to obtain a bank rating from the Tenderer's bank.

To this end, the Tenderer must provide with his tender, a bank rating, certified by his banker, to the effect that he will be able to successfully complete the contract at the tendered amount within the specified time for completion.

However, should the tenderer be unable to provide a bank rating with his tender, he shall be state the reasons thereof and in addition provide the following details of his banker and bank account details that he intends to use for the contract:

Name of Account Holder:
……

Name of Bank: …… Branch: ……..…

Account Number: …… Account Type: ……..……..….

Telephone Number: …… Fax Nº: …….

Name of Contact Person (*at bank)*: ..……..……

Failure to provide either the required bank details or a certified bank rating with his tender will lead to the conclusion that the Tenderer does not have the necessary financial resources at his disposal to complete the contract successfully within the specified time for completion.

The Employer undertakes to treat the information thus received as confidential, strictly for the use of evaluation of the tender submitted by the Tenderer.

SIGNATURE: .....……... DATE: …….....
(of person authorised to sign on behalf of the Tenderer)

FORM I: Form of Intent to Provide a Performance Guarantee

[The Tenderer must attach hereto a letter from the bank or institution. with whom he has made the necessary arrangements, to the effect that the said bank or institution will be prepared to provide the required performance guarantee when asked to do so].

Tenderers are to refer to Form C1.3: Form of Guarantee

FORM J: 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 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

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

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

*insert separate page if necessary

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

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

- ☐ a member of any municipal council
- ☐ 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 of state and position held	Status of service (tick appropriate column)	
		current	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;

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

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

Name of Enterprise .....

FORM K: Proof of Purchase of Tender Documents

The Tenderer shall insert here proof of purchase of the tender documents in the form of an official receipt or other acceptable form of proof.

STAMP

FORM L: MBD 4

DECLARATION OF INTEREST

1. No bid will be accepted from persons in the service of the state[1].

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

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

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

3.2 Identity Number: …….

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

3.4 Company Registration Number: …….

3.5 Tax Reference Number:……

3.6 VAT Registration Number: ……

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

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

3.8.1 If yes, furnish particulars. ….……

……..

[1]MSCM Regulations: "in the service of the state" means to be –

(a) a member of –
  (i) any municipal council;
  (ii) any provincial legislature; or
  (iii) the national Assembly or the national Council of provinces;

(b) a member of the board of directors of any municipal entity;
(c) an official of any municipality or municipal entity;
(d) an employee of any national or provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No.1 of 1999);
(e) 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? …**YES / NO**

3.9.1 If yes, furnish particulars.……..……..

…….

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

3.10.1 If yes, furnish particulars.

……
……

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

3.11.1 If yes, furnish particulars

……
……

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

3.12.1 If yes, furnish particulars.

……
……

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

3.13.1 If yes, furnish particulars.

……
……

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

3.14.1 If yes, furnish particulars:

……..
……..

Full details of directors / trustees / members / shareholders.

Full Name	Identity Number	State Employee Number

…….. ……..

Signature **Date**

……. ……

Capacity **Name of Bidder**

FORM L1: MBD5

DECLARATION FOR PROCUREMENT ABOVE R10 MILLION

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? **YES/NO**

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

……

……

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

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

2.2 If yes, provide particulars.

……
……
……
……

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

3.1 If yes, furnish particulars

……

……

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

4.1 If yes, furnish particulars

……

……

CERTIFICATION

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

……. ……
Signature Date

……
……
Name of Bidder Position

FORM M: 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

a) 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:

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

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

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

2. DEFINITIONS

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

3. FORMULAE FOR PROCUREMENT OF GOODS AND SERVICES

3.1. POINTS AWARDED FOR PRICE

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

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

80/20 or 90/10

$$Ps = 80\left(1 - \frac{Pt - P\,min}{P\,min}\right) \quad \text{or} \quad Ps = 90\left(1 - \frac{Pt - P\,min}{P\,min}\right)$$

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

80/20 **or** **90/10**

$$Ps = 80\left(1 + \frac{Pt - P\,max}{P\,max}\right) \text{ or } \quad Ps = 90\left(1 + \frac{Pt - P\,max}{Pmax}\right)$$

Where

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

4. POINTS AWARDED FOR SPECIFIC GOALS

4.1. In terms of Regulation 4(2); 5(2); 6(2) and 7(2) of the Preferential Procurement Regulations, preference points must be awarded for specific goals stated in the tender. For the purposes of this tender the tenderer will be allocated points based on the goals stated in table 1 below as may be supported by proof/ documentation stated in the conditions of this tender:

4.2. In cases where organs of state intend to use Regulation 3(2) of the Regulations, which states that, if it is unclear whether the 80/20 or 90/10 preference point system applies, an organ of state must, in the tender documents, stipulate in the case of—

(a) an invitation for tender for income-generating contracts, that either the 80/20 or 90/10 preference point system will apply and that the highest acceptable tender will be used to determine the applicable preference point system; or

(b) any other invitation for tender, that either the 80/20 or 90/10 preference point system will apply and that the lowest acceptable tender will be used to determine the applicable preference point system,

then the organ of state must indicate the points allocated for specific goals for both the 90/10 and 80/20 preference point system.

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

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

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

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)
1. OWNERSHIP				
Black Ownership ≥ 51%		8		
Less than 51 % owned by black people		4		
2. RDP GOALS				
Locality (Enterprise that is located within the Harry Gwala District Municipality		12		
Locality (Enterprise that is not located within the Harry Gwala District Municipality		6		
Locality (Enterprise located outside of South Africa)		0		

DECLARATION WITH REGARD TO COMPANY/FIRM

4.3. Name of company/firm……..

4.4. Company …….…….

4.5. Registration number: ……...

4.6. TYPE OF COMPANY/ FIRM

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

[TICK APPLICABLE BOX]

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

i) The information furnished is true and correct.

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

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

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

(a) disqualify the person from the tendering process;

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

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

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

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

……
SIGNATURE(S) OF TENDERER(S)

SURNAME AND NAME: ……

DATE: ……

ADDRESS: ……

……

……

……

FORM M1: MBD8 FORM

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 *audialterampartem* 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)? **egister 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 ☐

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.

……... **……..**
Signature **Date**

…….. **……**
Position **Name of Bidder**

FORM N: MBD 9

CERTIFICATE OF INDEPENDENT BID DETERMINATION

1 This Municipal Bidding Document (MBD) must form part of all bids[1] 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:

CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying bid:

_____
(Bid Number and Description)

in response to the invitation for the bid made by:

_____
(Name of Municipality / Municipal Entity)

do hereby make the following statements that I certify to be true and complete in every respect:

I certify, on behalf of:_____that:
(Name of Bidder)

1. I have read and I understand the contents of this Certificate.
2. I understand that the accompanying bid will be disqualified if this Certificate is found not to be true and complete in every respect;
3. I am authorized by the bidder to sign this Certificate, and to submit the accompanying bid, on behalf of the bidder.
4. Each person whose signature appears on the accompanying bid has been authorized by the bidder to determine the terms of, and to sign, the bid, on behalf of the bidder;
5. For the purposes of this Certificate and the accompanying bid, I understand that the word "competitor" shall include any individual or organization, other than the bidder, whether or not affiliated with the bidder, who:

   (a) has been requested to submit a bid in response to this bid invitation;
   (b) could potentially submit a bid in response to this bid invitation, based on their qualifications, abilities or experience; and
   (c) provides the same goods and services as the bidder and/or is in the same line of business as the bidder

6. The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However communication between partners in a joint venture or consortium[3] 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.

.....	.....
Signature	Date
.....	.....
Position	Name of Bidder

FORM O: Specific Goals Requirements

Tenderers are to attach certified copies of the following documentation to this page:

PREFERENCE POINT SYSTEM DESCRIPTION		NUMBER OF POINTS		VERIFICATION METHOD
SPECIFIC GOALS				
Enterprise located within the Harry Gwala District Municipality	**Locality Goals**	**12**	**12**	CIPC documents/CSD Report ID copies
Enterprise that is not located within the Harry Gwala District Municipality		4		
Black Ownership ≥ 51%	**Ownership**	8	8	CIPC documents/CSD Report ID copies
Less than 51 % owned by black people		4		
Total Points			**20**	

Tenderers are to note that failure to submit the above documentation may result in the non-award of other preference points during tender evaluation

FORM P: Joint Venture Disclosure Form

EMPLOYER	:	**Harry Gwala District Municipality**
CONTRACT DESCRIPTION	:	**Underberg Himeville Sewer Upgrade: Refurbishment (Ward 3 & 2)**
CONTRACT NUMBER	:	**HGDM902/HGDM/2026**
PROJECT REFERENCE NUMBER	:	

Note: 1) This form needs not be completed for Joint Ventures which have targeted enterprise partners.

2) All the information requested must be filled in the spaces provided. If additional space is required, additional sheets may be attached.

3) A copy of the joint venture agreement must be attached to this form. In order to demonstrate the targeted enterprise partner's share in the ownership, control, management responsibilities, risks and profits of the joint venture, the proposed joint venture agreement must include specific details relating to:

   i) The contributions of capital and equipment
   ii) Work items to be performed by the targeted enterprise partner's own forces.
   iii) Work items to be performed under the supervision of the targeted enterprise partner.
   iv) The commitment of management, supervisory and operative personnel employed by the targeted enterprise partner to be dedicated to the performance of the Contract.

4) Copies of all written agreements between partners concerning the contract must be attached to this form including those which relate to ownership options and to restrictions/limits regarding ownership and control.

5) Targeted enterprise partners must each complete an Enterprise Declaration Affidavits.

JOINT VENTURE PARTICULARS

Name : _____

Postal address : _____

Physical address : _____

Telephone : _____ Fax _____

IDENTITY OF EACH NON-TARGETED ENTERPRISE PARTNERS

Name : .....
Postal address : .....
Physical address : .....
Telephone : ..... Fax .....
Contact Person : .....

(Continue as required for further non-targeted enterprise partners)

Name : .....
Postal address : .....
Physical address : .....
Telephone : ..... Fax .....
Contact Person : .....

IDENTITY OF EACH TARGETED ENTERPRISE PARTNER

Name : .....
Postal address : .....
Physical address : .....
Telephone : ..... Fax .....
Contact Person : .....

Name : .....
Postal address : .....
Physical address : .....
Telephone : ..... Fax .....
Contact Person : .....

Name : .....
Postal address : .....
Physical address : .....
Telephone : ..... Fax .....
Contact Person : .....

DESCRIPTION OF THE ROLE OF THE TARGETED PARTNERS IN THE JOINT VENTURE

OWNERSHIP OF THE JOINT VENTURE

a)	Percentage Ownership in respect of	:	Targeted Enterprises	%	Targeted Enterprises	%
b)	Profit and Loss Sharing	:	Targeted Enterprises	%	Targeted Enterprises	%
c)	Initial Capital Contribution	:	Targeted Enterprises	R	Targeted Enterprises	R
d)	Ongoing Capital Contribution	:	Targeted Enterprises	R	Targeted Enterprises	R
e)	Major Plant and Equipment Contribution	:	Targeted Enterprises		Targeted Enterprises	

RECENT CONTRACTS EXECUTED BY PARTNERS IN THEIR OWN RIGHT OR AS PARTNERS IN OTHER JOINT VENTURES

Targeted Enterprise Partners

1. :
2. :
3. :
4. :
5. :

Non-Targeted Enterprise Partners

1. :
2. :
3. :
4. :
5. :

CONTROL AND PARTICIPATION IN THE JOINT VENTURE

(Identify by name and firm those individuals who are, or will be, responsible for, and have authority to engage in the relevant management functions and policy and decision making, indicating any limitations in their authority e.g. co-signature requirements and Rand limits).

Function	Targeted Enterprise Partner		Non-Targeted Enterprise	
	Enterprise	Name of Person	Enterprise	Name of Person
Cheque Signing				
Authority to enter into contracts on behalf of the Joint Venture				
Signing, co-signing and/or collateralizing of loans				
Acquisition of lines of credit				
Acquisition of performance bonds				
Negotiating and signing labour agreements				

MANAGEMENT OF CONTRACT PERFORMANCE

(Fill in the name and firm of the responsible person).

Function	Targeted Enterprise Partner		Non-Targeted Enterprise	
	Enterprise	Name of Person	Enterprise	Name of Person
Supervision of field operations				
Major purchasing				
Estimating				
Technical management				

MANAGEMENT AND CONTROL OF JOINT VENTURE

a) Managing Partner **:** ----------

b) What authority does each partner have to commit or obligate the other to financial institutions, insurance companies, suppliers, subcontractors and /or other parties participating in the execution of the contemplated works?

Partner	***Targeted Enterprise Status***		***Authority Status***	
	YES	***NO***	***YES***	***NO***

PERSONNEL

a. State the approximate number of operative personnel (by trade/ function/ discipline) needed to perform the Joint Venture work under the contract.

TRADE/FUNCTION/	**Total Qty Required**	**Qty supplied by Targeted Enterprise**	**Qty supplied by non-Targeted Enterprise**

b) Name of individual who will be responsible for hiring Joint Venture employees **:** ----------

c) Name of individual who will be responsible for preparation of Joint venture payrolls **:** ----------

CONTROL AND STRUCTURE OF THE JOINT VENTURE

Briefly describe the manner in which the Joint Venture is structured and controlled.

The undersigned warrants that he/she is duly authorized to sign this Joint Venture Disclosure Form and affirms that the foregoing statements are correct and include all material information necessary to identify and explain the terms and operations of the Joint Venture and the intended participation of each partner in the undertaking.

The undersigned further covenants and agrees to provide the Employer with complete and accurate information regarding actual Joint Venture work and the payment therefore, and any proposed changes in any provisions of the Joint Venture agreement, and to permit the audit and examination of the books, records, and files of the Joint Venture, or those of each partner relevant to the Joint Venture, by duly authorized representatives of the Employer.

Signature : .....

Name : .....

Duly authorised to sign on behalf of : .....

Address : .....

.....

Telephone : .....

Fax : .....

Date : .....

CONTRACT No. HGDM902/HGDM/2026

UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

PART T2.2: RETURNABLE DOCUMENTS THAT WILL BE INCORPORATED INTO THE CONTRACT

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FORM Q: Schedule of Construction Plant & Equipment

The following are lists of major Construction Plant and Equipment that I / We presently own or Lease and will have available for this contract if my / our tender is accepted. Tenderer shall submit a certificate of ownership / title / registration document to prove ownership.

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

DESCRIPTION ***(type, size, capacity etc)***	**QUANTITY**	**YEAR OF MANUFACTURE**

Attach additional pages if more space is required

(b) **Details of major Plant & Equipment that will be hired, or acquired for this contract if my / our tender is accepted**

DESCRIPTION ***(type, size, capacity etc)***	**QUANTITY**	**HOW ACQUIRED**	
		HIRE/ BUY	**SOURCE**

Attach additional pages if more space is required

SIGNATURE: .....……..... DATE: .....
(of person authorised to sign on behalf of the Tenderer)

FORM R: Schedule of Proposed Sub-Contractors

I/We hereby notify you that it is my/our intention to employ the following Sub-Contractors for work in this contract.

NAMES AND ADDRESSES OF PROPOSED SUBCONTRACTORS	NATURE AND EXTENT OF WORK TO BE SUBCONTRACTED	PREVIOUS EXPERIENCE WITH SUBCONTRACTOR OR RECENT WORK EXECUTED BY THE SUB-CONTRACTOR

SIGNATURE: .....…….. **DATE: ….....**
(of person authorised to sign on behalf of the Tenderer)

FORM S: Record of Addenda to Tender Documents

Note: This *is only applicable where the addendum was issued only.*

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

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

Attach additional pages if more space is required.

Failure to acknowledge any addendum released by Harry Gwala District Municipality may result in your tender submission being declared non-responsive.

SIGNATURE: .....……..…….. DATE: …….....
(Of person authorised to sign on behalf of the Tenderer)

FORM T: Key Personnel

Tenderers shall provide details and attach CVs of the Contracts Manager, Site Agent(s), General Foreman's and experience in work of a similar nature to that for which their tender is submitted.

Failure to complete this schedule may result in the tender not being considered.

a. Contracts Manager

CONTRACTS MANAGER	**NAME:……**			
CONTRACT & CLIENT	**NATURE OF WORK**	**POSITION HELD**	**VALUE OF WORK**	**YEAR COMPLETED**

b. Site Agent

SITE AGENT	**NAME:……**			
CONTRACT & CLIENT	**NATURE OF WORK**	**POSITION HELD**	**VALUE OF WORK**	**YEAR COMPLETED**

c. Foreman

GENERAL FOREMAN	**NAME:……**			
CONTRACT & CLIENT	**NATURE OF WORK**	**POSITION HELD**	**VALUE OF WORK**	**YEAR COMPLETED**

Tenderers are required to complete the Functionality Evaluation Criteria – Tenderer Self-Assessment table included in the table below.

FUNCTIONALITY EVALUATION CRITERIA – TENDERER SELF-ASSESSMENT				
Tenderers must select the applicable score for each criterion, insert their self-score, and provide the exact document reference for supporting evidence. Final scoring remains subject to evaluator verification.				
Key Criteria Aspect	**Basis for Points Allocation**	**Points Available**	**Max Score**	**Tenderer Self-Score**
Experience of Key Personnel (Contracts Manager/Director)	Degree/Diploma or higher qualification in Civil Engineering, professional registration with ECSA or SACPCMP and relevant experience in the position		5	
	Less than 1 year of relevant experience in the position	0		
	1 to less than 3 years' relevant experience in the position	1		
	3 to less than 5 years' relevant experience in the position.	3		
	5 years or more of relevant experience in the position	5		
Experience of Key Personnel (Site Agent)	Relevant and accredited Degree/National Diploma, or equivalent qualification in Civil Engineering or Construction Management. Professional Registration with the Engineering Council of South Africa (ECSA) as a Pr Eng, Pr Tech, Pr Techni; or registration with SACPCMP as a Professional Construction Manager (Pr CM) or Professional Construction Project Manager (Pr CPM).		5	
	Less than 1 year of relevant experience in the position	0		
	1 to less than 3 years' relevant experience in the position	1		
	3 to less than 5 years' relevant experience in the position.	3		
	5 years or more of relevant experience in the position	5		
Experience of Key Personnel (Foreman)	Less than 1 year of relevant experience.	0	5	
	1 to less than 3 years' relevant experience in the position	1		
	3 to less than 7 years' relevant experience in the position	3		
	7 years or more relevant experience in the position	5		

SIGNATURE: .....……..... DATE: .....
(of person authorised to sign on behalf of the Tenderer)

FORM U: Rates for Special Materials

Each material dealt with as a special material in terms of Clause 4 of the Contract Price Adjustment Schedule of the Conditions of Contract is stated in the list below. The rates and prices for the special materials shall be furnished by the Tenderer, which rates and prices shall not include VAT but shall include all other obligatory taxes and levies.

SPECIAL MATERIAL	UNIT*	Rate or Price for the Base Month

Indicate whether the material will be delivered in bulk or in containers.

Notes to Tenderer:

When called upon to do so, the tenderer shall substantiate the above rates or prices with acceptable documentary evidence.

Signed: ……..…….. Date: ……

Name: ……..… Position: ……..

SIGNATURE: .....……..... **DATE:** …….....
(of person authorised to sign on behalf of the Tenderer)

FORM V: Contractor's Health and Safety Declaration

In terms of Clause 4(4) of the OHSA 1993 Construction Regulations 2003 (referred to as "the Regulations" hereafter), a Contractor may only be appointed to perform construction work if the Employer is satisfied that the Contractor has the necessary competencies and resources to carry out the work safely in accordance with the Occupational Health and Safety Act No 85 of 1993 and the OHSA 1993 Construction Regulations 2003.

To that effect a person duly authorised by the tenderer must complete and sign the declaration hereafter in detail.

Declaration by Tenderer

1. I the undersigned hereby declare and confirm that I am fully conversant with the Occupational Health and Safety Act No 85 of 1993 (as amended by the Occupational Health and Safety Amendment Act No 181 of 1993), and the OHSA 1993 Construction Regulations 2003.
2. I hereby declare that my company / enterprise has the competence and the necessary resources to safely carry out the construction work under this contract in compliance with the Construction Regulations and the Employer's Health and Safety Specifications.
3. I hereby undertake, if my tender is accepted, to provide a sufficiently documented Health and Safety Plan in accordance with Regulation 5(1) of the Construction Regulations, approved by the Employer or his representative, before I will be allowed to commence with construction work under the contract. I hereby agree that my company/enterprise will not have a claim for compensation for delay or extension of time because of my failure to obtain the necessary approval for the said safety plan.
4. I confirm that copies of my company's approved Health and Safety Plan, the Employer's Safety Specifications as well as the OHSA 1993 Construction Regulations 2003 will be provided on site and will at all times be available for inspection by the Contractor's personnel, the Employer's personnel, the Engineer, visitors, and officials and inspectors of the Department of Labour.
5. I hereby confirm that adequate provision has been made in my tendered rates and prices in the bill of quantities to cover the cost of all resources, actions, training and all health and safety measures envisaged in the OHSA 1993 Construction Regulations 2003, including the cost for specific items that may be scheduled in the bill of quantities.
6. I hereby confirm that I will be liable for any penalties that may be applied by the Employer in terms of the said Regulations for failure on my part to comply with the provisions of the Act and the Regulations as set out in Regulation 30 of the Regulations.
7. I agree that my failure to complete and execute this declaration to the satisfaction of the Employer will mean that I am unable to comply with the requirements of the OHSA 1993 Construction Regulations 2003, and accept that my tender will be prejudiced and may be rejected at the discretion of the Employer.
8. I am aware of the fact that, should I be awarded the contract, I must submit the notification required in terms of Regulation 3 of the OHSA 1993 Construction Regulations 2003 *(example attached hereafter)* before I will be allowed to proceed with any work under the contract.

SIGNATURE: ..... DATE: .....….....

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

PRO FORMA NOTIFICATION FORM IN TERMS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT 1993, CONSTRUCTION REGULATIONS 2003

[In terms of Regulation 3 of the Construction Regulations 2003, the successful Tenderer must complete and forward this form prior to commencement of work to the office of the Department of Labour.]

1. (a) Name and postal address of Contractor: .....

   .....

   (b) Name of Contractor's contact person: .....

   Telephone number: .....

2. Contractor's compensation registration number: .....

3. (a) Name and postal address of client: .....

   .....

   (b) Name of client's contact person or agent:.....

   Telephone number .....

4. (a) Name and postal address of designer(s) for the project: .....

   .....

   (b) Name of designer's contact person: .....

   Telephone number .....

5. Name of Contractor's construction supervisor on site appointed in terms of

   Regulation 6(1): ....
   Telephone number: .....

6. Name/s of 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 subcontractors on the construction site accountable to Contractor: .....

13. Name(s) of subcontractors already chosen:

    .....

    .....

SIGNED BY:
CONTRACTOR:.....……..... DATE:.....

CLIENT:.....…… DATE:.....

FORM W: UIF Registration Certificate

Tenderers to attach copy of UIF Registration Certificate

FORM X: Certificate of Municipal Services

Information required in terms of the Harry Gwala District Municipality's Supply Chain Management Policy. Latest municipal services account statement must be attached.

Tender Number: HGDM902/HGDM/2026

Name of the Tenderer: _____

FURTHER DETAILS OF THE BIDDER/S: Proprietor / Director(s) / Partners, etc:

Physical Business address of the Bidder	Municipal Account Number(s)

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

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

I, _____, the undersigned,
(full name in block letters)
certify that the information furnished on this declaration form is correct and that I/we have no undisputed commitments for municipal services towards a municipality or other service provider in respect of which payment if overdue for more than 30 days.

_____
Signature

THUS DONE AND SIGNED for and on behalf of the Bidder / Contractor

at _____ on the _____ day of _____ 2026

Please note:
Even if the requested information if not applicable to the Bidder, the table above should be endorsed NOT APPLICABLE and THIS DECLARATION MUST STILL BE SIGNED.

MUNICIPAL SERVICES STATEMENT

Tenderers are to attach the latest statement (not more than 3 months old) from the municipality where the Tenderer receives municipal services.

FORM Y: Quality Management System (Quality Assurance Plan & Control Procedures)

Tenderer must submit proof of quality management system that they use in the conduct of their business. and construction processes.

Certified Quality Management System

Please attach ISO 9001 certificate by a certifying body e.g., South African National Standards or other recognised certifying bodies.

OR

Internal / Own Quality Management System

Attach an abridged version / summary version of own quality document.

Signed: ……..…….. Date: ……

Name: ……..…. Position: ……..

SIGNATURE: .....… DATE: …….....

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

FORM Z: Supply Chain Management Policy

56.1 LOCAL PRODUCTION AND CONTENT

56.1.1 Bids in respect of services, works or goods that have been designated for local production and content, must contain a specific bidding condition that only locally produced goods, services or works or locally manufactured goods with a stipulated minimum threshold for local production and content will be considered.

56.1.1 If there is no designated sector, an organ of state may include, as a specific condition of the tender, that only locally produced services or goods or locally manufactured goods with a stipulated minimum threshold for local production and content, will be considered.

57. Subcontracting as condition of tender

(1) If feasible to subcontract for a contract, an organ of state must apply subcontracting to advance designated groups.

(2) If an organ of state applies subcontracting, the successful tenderer must subcontract a minimum of threshold of the value of the contract must exclude contingencies, provisional sums and value added taxes as follows follows:

I. If a tender exceeding R5 million (VAT Incl.) is awarded to a main contractor as determined by the complexity of the project. A minimum 5% to one subcontractor being appointed.

II. If a tender exceeding R10 million (VAT Incl.) is awarded to a main contractor as determined by the complexity of the project. A minimum of 10% to one subcontractor being appointed.

III. If a tender exceeding R20 million (VAT Incl.) is awarded to a main contractor as determined by the complexity of the project, A minimum 15% to at least two subcontractors being appointed.

IV. If a tender exceeding R30 million (VAT Incl.) is awarded to a main contractor as determined by the complexity of the project, A minimum 30% to at least three subcontractors being appointed.

1) The subcontracting will only cater for local businesses who will be appointed by the Main contractor on a rotational basis from a roster to be maintained by the municipality per local.

58. APPROVAL AND IMPLEMENTATION OF POLICY

This policy shall be implemented once approved by council and effective from 01 July 2022

CONTRACT No. HGDM902/HGDM/2026
UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

PART C1: AGREEMENTS AND CONTRACT DATA

C1.1 Form of Offer and Acceptance A:

A. Offer

The Employer, identified in the Acceptance signature block, has solicited offers to enter into a Contract for the procurement of: **CONTRACT NUMBER: HGDM902/HGDM/2026**

UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

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 apart 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 PRICE INCLUSIVE OF VALUE ADDED TAX (VAT) 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: .....

Name: *(in capitals)* .....

Capacity: .....

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

Address: .....
.....
.....

Tel: …….. Fax: ……

Witness:

Signature: ..... Name: .....……

Date: ..... CIDB Registration Nº:…….

B: Acceptance

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

The terms of the contract, are contained in

Part C1 Agreements and contract data, (which includes this agreement)

Part C2 Pricing data

Part C3 Scope of work

Part C4 Site information

and drawings and documents or parts thereof, which may be incorporated by reference into Parts C1 to C4 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's agent (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 fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

Notwithstanding anything contained herein, this agreement comes into effect on the date when the tenderer receives one fully completed original copy of this document, including the schedule of deviations (if any). Unless the tenderer (now contractor) within five 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: .....

Name: *(in capitals)* .....

Capacity: .....

Name of Employer *(organisation):* .....

Address**:** .....

.....

Witness:

Signature: ..... Name: .....……

Date: .....

C: Schedule of Deviations

Notes:

1. The extent of deviations from the tender documents issued by the employer prior to the tender closing date is limited to those permitted in terms of the 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.

Subject _____
Details _____
_____

Subject
_____
Details_____
_____

Subject _____
Details _____
_____

Subject _____
Details_____
_____

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: .....

Name: ....

Capacity: ....

Tenderer: *(Name and address of organisation)*

.....

Witness:

Signature: .....

Name: .....

Date: .....

FOR THE EMPLOYER

Signature: .....

Name: ....

Capacity: ....

Employer: *(Name and address of organisation)*

.....

Witness:

Signature: .....

Name: .....

Date: ……..

D: Confirmation of Receipt

The Tenderer, (now Contractor), identified in the Offer part of this Agreement hereby confirms receipt from the Employer, identified in the Acceptance part of this Agreement, of one fully completed original copy of this Agreement, including the Schedule of Deviations (if any) today:

The ……(day)

of ……..(month)

20…….(year)

at ……(place)

For the Contractor:

……
Signature

……
Name

……
Capacity

Signature and Name of Witness:

……
Signature

……
Name

PART C1.2 CONTRACT DATA

C1.2.1 General Conditions of Contract

The General Conditions of Contract for Construction Works (4th Edition 2025) published by the South African Institution of Civil Engineering, Private Bag X200, Halfway House, 1685 is applicable to this contract.

Copies of these conditions of contract may be obtained from the South African Institution of Civil Engineering (Tel 011- 805 5947, Fax: 011 – 805 5971).

The Contract Data referred to in the General Conditions of Contract follow, with the Data to be completed Employer furnished. The Tenderer is to provide his details in the spaces provided.

C1.2.2 Contract Data Provided by Employer

	GCC 2025 Clause	
Defects Liability Period	1.1.1.13	12 months
Name of Employer	1.1.1.15	Harry Gwala District Municipality
Address of Employer	1.2.1.2	40 main Street, Ixopo, 3276 Harry Gwala District Municipality P O Box X501 IXOPO 3276 Email address: GwalaL@harrygwaladm.gov.za Tel Nº: +27 39 834 8700 Fax Nº: +27 39 834 2259
Name of Engineer	1.1.1.16	DLV Project Managers & Engineers (Pty) Ltd
Address of the Engineer	1.2.1.2	DLV Project Managers & Engineers (Pty) Ltd 13 Ennisdale Drive Durban North 4001 Email: suveer@dlveng.co.za Tel : +27 39 315 0329
Pricing Strategy	1.1.1.26	Re-measurement Contract
Subcontracting	4.4.7	Add the following new Clause: **The contractor will be required to subcontract in reference to form m: preferential Procurement under subcontracting as condition of tender item for work to be subcontracted to local subcontractors. The work to be subcontracted will also be agreed upon with the Employer**
Documentation Required Before Commencement of Construction Works	5.3.1	Health and Safety File (Refer to Clause 4.3) Initial Programme (Refer to Clause 5.6) Security (Refer to Clause 6.2) Insurances (Refer to Clause 8.6)

	GCC 2025 Clause	
Time to Submit the Documentation Before Commencement with the Works	5.3.2	14 days after commencement date
Non-working Days	5.8.1	Sundays
Special Non-working days	5.8.1	1. Public Holidays 2. The year-end break commencing on the first day, working day, after 15 December and ending on the first Tuesday after 5 January of the next year
Penalty for Failing to Complete the Works	5.13.1	**0.0005 (0.05%) of contract amount per calendar day**
The Latent Defect Period	5.16.3	10 years
Contract Price Adjustment Schedule	6.8.2	x = 0,15 a = 0,20 b = 0,20 c = 0,50 d = 0,10 'L' shall be the "Weighted Average" index, P0141, Table A 'F' shall be the "Fuel (Diesel)" index given in P0142.1 Table 12 for KwaZulu Natal The base month will be the month prior to the month in which tenders close.
Area for Producer Price Index		Pietermaritzburg
Base Month		Month before closing date of Tenders
Price Adjustments for Special Materials	6.8.3	Price adjustments for variations in the costs special materials are allowed
The Percentage Advance on Materials not yet Built into the Permanent Works	6.10.1.5	80% (subject to provision of Indemnity for Materials on Site)
Limit of Retention Money	6.10.3	10% of Contract Sum
Value of Plant and Material Supplied by Employer to be included in the insurance sum	8.6.1.1.2	Nil
Amount to cover professional fees for repairing damage and loss	8.6.1.1.3	14% of Repair Amount
Limit of Indemnity for Liability Insurance	8.6.1.3	R10, 000, 000.00 for each and every claim

	GCC 2025 Clause	
Dispute Resolution	10.5.1	Standing Adjudication Board
Number of Adjudication Board Members to be Appointed	10.5.3	One
Dispute Determination	10.7.1	Dispute Determination shall be by Arbitration

SIGNATURE OF TENDERER: .....

DATE: .....

C1.2.3 Data Provided by the Contractor

	GCC 2025 Clause	
Name of Contractor	1.1.1.9	…….....
Address of Contractor (Physical and Postal) Tel: Fax: Email:	1.2.1.2	……..... ……..... ....
Time for Achieving Practical Completion:	1.1.1.14	**12 Months**
Security to be Provided by Contractor	6.2.1	Refer to Table Below

Type of Security	**Contractor's Choice (Indicate "YES" or "NO")**
Is Value Added Tax included in the Contract Sum and value of Works for calculating percentages?	
Cash deposit of 10% of the Contract Sum	
Performance Guarantee of 10% of the Contract Sum	
Retention of 10% of the value of Works	
Cash Deposit of 10% of the Contract Sum plus Retention of 10% of the value of Works	
Performance Guarantee of 10% of the Contract Sum plus Retention of 10% of the value of Works	

Price variation of special materials*	6.8.3	..... ……
Type of Special Material	Unit	Rate or Price*
Rate or price for base month of*	6.8.2	..... ……

Tenderers are to note that failure to provide a time for completion of the contract will invalidate the tender offer.

***** ***Delete inapplicable***

Signature: .....

Name of Signatory: .....

Date: .....

Name of Tenderer .....

C1.3: PERFORMANCE GUARANTEE

For use with the General Conditions of Contract for Construction Works, Fourth Edition, 2025.

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: .....

……

"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.

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 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 receipt of a first written demand from the Employer to the Guarantor at the Guarantor's physical address calling up this Performance Guarantee, such demand stating that:

5.1 the contract has been terminated due to the Contractor's default and that this Performance Guarantee is called up in terms of 5; or

5.2 a provisional or final sequestration or liquidation court order has been granted against the Contactor and that the Performance Guarantee is called up in terms of 5; and

5.3 the aforesaid written demand is accompanied by a copy of the notice of termination and/ or the provisional/ final sequestration and / or the provisional liquidation court order.

6. It is recorded that the aggregate amount of payments required to be made by the Guarantor in terms of 4 and 5 shall not exceed the Guarantor's maximum liability in terms of 1.

7. Where the Guarantor has made payment in terms of 5, the Employer shall upon the date of issue of the Final Payment Certificate submit an expense account to the Guarantor showing how all monies received in terms of this Performance Guarantee have been expended and shall refund to the Guarantor any resulting surplus. All monies refunded to the Guarantor in terms of this Performance Guarantee shall bear interest at the prime overdraft rate of the Employer's bank compounded monthly and calculated from the date payment was made by the Guarantor to the Employer until the date of refund.

8. Payment by Guarantor in terms of 4 or shall be made within seven (7) calendar days upon receipt of the first written demand to the Guarantor.

9. Payment of 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 his Performance Guarantee on account of any conduct alleged to the prejudicial to the Guarantor.

11. The Guarantor chooses the physical address as stated above for the service 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. The original of this Guarantee shall be returned to 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 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 1994, 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 my 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) .....

C1.4: DISCLOSURE STATEMENT

(Date)……

Contract*: (Name)*……..

Contractor: *(Name)*……...

Employer: *(Name)*……

Engineer: *(Name)*……

Dear Sirs,

I am willing and available to serve as (ad-hoc/standing) Adjudication Board Member in the above-mentioned Contract.

In accordance with the General Conditions of Contract for Construction Works Adjudication Board Rules relating to disclosure statements by selected or nominated persons to the adjudication, I hereby state that:

1. I shall act with complete impartiality and know of nothing at this time, which could affect my impartiality.

2. I had no previous involvement with this project.

3. I do not have any financial interest in this project.

4. I am not currently employed by the Contractor, Employer or Engineer.

5. I do not have any financial connections with the Contractor, Employer or Engineer.

6. I do not have or not have had a personal relationship with any authoritative member of the Contractor, Employer or the Engineer which could affect my impartiality.

7. I undertake to immediately disclose to the parties any changes in the above position which could affect my impartiality or be perceived to affect the same.

Should there be any deviation from the foregoing statements, details shall be given hereunder.

……
……
……

I further declare that I am experienced in the work which is carried out under the Contract and in interpreting contract documentation.

Name in full: .....

Signature: .....

C1.5: AGREEMENT IN TERMS OF SECTION 37(2) OF THE OCCUPATIONAL HEALTH AND SAFETY ACT No 85 OF 1993

THIS AGREEMENT is made between **HARRY GWALA DISTRICT MUNICIPALITY** (hereinafter called the EMPLOYER) of the one part, herein represented by:

.....
.....

in his capacity as:

AND:

(Hereinafter called the CONTRACTOR) of the other part, herein represented by

.....
.....

in his capacity as:

duly authorized to sign on behalf of the Contractor.

WHEREAS the CONTRACTOR is the Mandatory of the EMPLOYER in consequence of an agreement between the CONTRACTOR and the EMPLOYER in respect of

CONTRACT No: ..... (CONTRACT TITLE)

.....
..... for the construction, completion and maintenance of the works;

AND WHEREAS the EMPLOYER and the CONTRACTOR have agreed to enter into an agreement in terms of the provisions of Section 37(2) of the Occupational Health and Safety Act No 85 of 1993, as amended by OHSA Amendment Act No 181/1993 (hereinafter referred to as the ACT);

NOW THEREFORE the parties agree as follows:

1. The CONTRACTOR undertakes to acquaint the appropriate officials and employees of the CONTRACTOR with all relevant provisions of the ACT and the regulations promulgated in terms thereof.

2. The CONTRACTOR undertakes to fully comply with all relevant duties, obligations and prohibitions imposed in terms of the ACT and Regulations: Provided that should the EMPLOYER have prescribed certain arrangements and procedures that same shall be observed and adhered to by the CONTRACTOR, his officials and employees. The CONTRACTOR shall bear the onus of acquainting himself/herself/itself with such arrangements and procedures.

3. The CONTRACTOR hereby accepts sole liability for such due compliance with the relevant duties, obligations, prohibitions, arrangements and procedures, if any, imposed by the ACT and Regulations, and the CONTRACTOR expressly absolves the EMPLOYER and the Employer's CONSULTING ENGINEERS from being obliged to

comply with any of the aforesaid duties, obligations, prohibitions, arrangements and procedures in respect of the work included in the contract.

4. The CONTRACTOR agrees that any duly authorized officials of the EMPLOYER shall be entitled, although not obliged, to take such steps as may be necessary to ensure that the CONTRACTOR has complied with his undertakings as more fully set out in paragraphs 1 and 2 above, which steps may include, but shall not be limited to, the right to inspect any appropriate site or premises occupied by the CONTRACTOR, or to take such steps it may deem necessary to remedy the default of the CONTRACTOR at the cost of the CONTRACTOR.

5. The CONTRACTOR shall be obliged to report forthwith to the EMPLOYER any investigation, complaint or criminal charge which may arise as a consequence of the provisions of the ACT and Regulations, pursuant to work performed in terms of this agreement, and shall, on written demand, provide full details in writing of such investigation, complaint or criminal charge.

Thus, signed at ..... for and on behalf of the
CONTRACTOR

on this the ..... day of …….. 20……

SIGNATURE:
……

NAME AND SURNAME:
.....

CAPACITY:
.....

WITNESSES: 1. .....
2. .....

Thus, signed at ..... for and on behalf of the
EMPLOYER

on this the …….. day of ..... 20……

SIGNATURE:
.....

NAME AND SURNAME:
.....

CAPACITY:
.....

WITNESSES: 1. .....
2. .....

C1.6: ADJUDICATION BOARD MEMBER AGREEMENT

This Agreement is entered into between:

Adjudication Board Member: *(Name, physical address, postal address, email address, fax number, telephone number and mobile number)*……
……
……

Contractor: *(Name, physical address, postal address, email address, fax number, telephone number and mobile number)*
……
……
……

Employer*: (Name, physical address, postal address, email address, fax number, telephone, number and mobile number)*
……
……
……

The contractor and the Employer will hereinafter be collectively referred to as “the Parties”.

The Parties entered into a Contract for …..... (*name of project*) which provides that a dispute under or in connection with the General Conditions of Contract for Construction Works, Fourth Edition, 2025, must be referred to (*ad-hoc adjudication/ standing adjudication***).

The undersigned natural person has been appointed to serve as Adjudication Board Member and together with the undersigned Parties agree as follows:

1. The Adjudication Board Member accepts to perform his duties in accordance with the terms of the Contract, the General Conditions of Contract for Construction Works Adjudication Board Rules and this Agreement.

2. The Adjudicator undertakes to remain independent and impartial of the Contractor, Employer and Engineer for the duration of the Adjudication Board proceedings.

3. The Adjudication Board Member agrees to serve for the duration of the Adjudication Board proceedings.

4. The Parties may at any time, without cause and with immediate effect, jointly terminate this Agreement.

5. Unless the Parties agree, the Adjudication Board Member shall not act as arbitrator or representative of either Party in any subsequent proceedings between the Parties under the Contract. No Party may call the Adjudication Board Member as a witness in any such subsequent proceedings.

6. The standing Adjudication Board's duties shall end upon the Adjudication Board Member(s) receiving notice from the Parties of their joint decision to disband the Adjudication Board.

7. The Adjudication Board Member shall be paid in respect of time spent upon or in connection with the adjudication including time spent travelling:

   a. A monthly retainer of R……(*amoun*t) for ……(*number)* of months, and /or
   b. A daily fee of R……(*amount*) based on a ……..(*number*) hour day, and /or
   c. A hourly fee of R……(*amount*), and /or
   d. A non- recurrent appointment fee of R……(*amount*) which shall be accounted for in the final sums payable.

8. The Adjudication Board Member's expenses incurred in adjudication work shall be reimbursed at cost.

   Upon submission of an invoice for fees and expenses to the Parties, the (*Contractor/ Employer***) shall pay the full amount within 28 days of receipt of the invoice and he shall be reimbursed by the other party by half the amount so that the fees and expenses are borne equally by the Parties. Late payment of such invoice shall attract the interest at prime plus 3% points compounded monthly at the prime rate changed by the Adjudication Board Member's bank.

   This Agreement is entered into by:

Contractor's Signature	:	……..
Contractor's name	:	……..
Place	:	……..
Date	:	……..
Employer's signature	:	……..
Employer's name	:	……..
Place	:	……..
Date	:	……..
Adjudication Board Member's signature	:	……..
Adjudication Board Member's name	:	……..
Place	:	……..
Date	:	……..

CONTRACT No. HGDM902/HGDM/2026

UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

PART C2: PRICING DATA

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PART C2: PRICING DATA

C2.1 Pricing Instructions

1 The 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 Tenderer 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. 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 Tender is based.

6 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 Tenderer 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 tendered rates shall apply should work under these items actually be required.

Should the Tenderer group a number of items together and tender one sum for such group of items, the single tendered 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 included in another item shall be deemed to be nil.

The tendered 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.

7 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.

8 PROVISIONAL SUM

Where Provisional sums or Prime Cost sums are provided for items in the Bill of Quantities, payments for the Work done under such items will be made accordance with Clause 6.6 of **GCC 2025 (4th Edition) of the General Condition of Contract**. The Employer reserves the right, during the execution of the works, to adjust the stated amounts upwards or downwards according to the work actually done under the item, or the item may be omitted altogether, without affecting the validity of the Contract, such approval shall be granted by the Executive Director Infrastructure Services as delegated by the Accounting Officer.

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

9 CONTINGENCY

The sum provided under contingency in the Bill of Quantities is under the sole control of the Employer and may be deducted in whole or in part and shall only be expended by order of the Employer as Variation Order.

The use of contingency shall be upon approval by the Executive Director …… Services as delegated by the Accounting Officer.

10 PAYMENT FOR THE LABOUR-INTENSIVE COMPONENT OF THE WORKS

Those parts of the works to be constructed using labour-intensive methods are marked in the bill of quantities with the letters LI either in a separate column or as a prefix or suffix against every item so designated. The works, or parts of the works so designated are to be constructed using labour-intensive methods only. The use of plant to provide such works, other than plant specifically provided for in the scope of work, is a deviation from the contract. The items marked with the letters LI are not necessarily an exhaustive list of all the activities which must be done by hand and this clause does not over-ride any of the requirements in the generic labour-intensive specification in the Scope of Works.

Where minimum labour intensity is specified in the design, the contractor is expected to use their initiative to identify additional activities that can be done labour-intensively in order to comply with the set minimum labour intensity targets.

Payment for items which are designated to be constructed labour-intensively (either in this schedule or in the Scope of Works) will not be made unless they are constructed using labour-intensive methods. Any unauthorised use of plant to carry out work which was to be done labour-intensively will not be condoned and any works so constructed will not be certified for payment. Any non-payment for such works shall not relieve the Contractor in any way from his obligations either in contract or in delict.

11. Linkage of Payment for Labour-Intensive Component of Works to Submission of Project Data

The Contractor's payment invoices shall be accompanied by labour information for the corresponding period in a format specified by the employer. If the contractor chooses to delay submitting payment invoices, labour returns shall still be submitted as per frequency and timeframes stipulated by the Employer. The contractor's invoices shall not be paid until all pending labour information has been submitted. The client may institute a penalty relating to outstanding labour information.

The following information shall be maintained on site and submitted in electronic/hard copy formats:

- Certified ID copies of all locally employed labour
- Signed Contracts between the employer and the EPWP Participants
- Attendance Registers for the EPWP Participants
- Proof of Payment of EPWP Employees
- Monthly Reporting Template as per EPWP requirements

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	kW	=	kilowatt
m	=	metre	kN	=	kilonewton
km	=	kilometre	kg	=	kilogram
km-pass	=	kilometre-pass	t	=	ton (1 000 kg)
m²	=	square metre	%	=	per cent
m²-pass	=	square metre-pass	MN	=	meganewton
ha	=	hectare	MN-m	=	meganewton-metre
m³	=	cubic metre	PC Sum	=	Prime Cost Sum
m³-km	=	cubic metre-kilometre	Prov Sum	=	Provisional Sum
No.	=	number			

11 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 Tenderer tenders to do the work
Amount	:	The quantity of an item multiplied by the tendered rate of the (same) item
Sum	:	An amount tendered 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

C 2.2 Schedule of Quantities

CONTRACT No. HGDM902/HGDM/2026

UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

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C3.1 STANDARDISED SPECIFICATIONS

The standard specifications on which this contract is based are Standards South Africa's Standardized Specifications for Civil Engineering Construction SABS 1200.

Although not bound in nor issued with this Document, the following Sections of the Standardized Specifications of SABS 1200 shall form part of this Contract:

A	1986	:	GENERAL
AA	1986		GENERAL - SMALL WORKS
AB	1986	:	ENGINEER'S OFFICE
C	1980	:	SITE CLEARANCE (As amended 1982)
D	1988		EARTHWORKS
DA	1988	:	EARTHWORKS (Small Works)
DB	1989	:	EARTHWORKS (Pipe trenches)
G	1982		CONCRETE - STRUCTURAL
GA	1982	:	CONCRETE (SMALL WORKS)
GE	1984		PRECAST CONCRETE - STRUCTURAL
HA	1990	:	STRUCTURAL STEELWORKS
LB	1990	:	BEDDING - PIPES
L	1983.		MEDIUM PRESSURE PIPELINES
LC	1981		CABLE DUCTS
H	1985		STRUCTURAL STEELWORK
HC	1988	:	CORROSION PROTECTION FOR STRUCTURAL STEELWORKS

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 SABS) in Pretoria.

SANS 1921 (2004): Construction and Management Requirements for Works Contracts

- Part 1: General Engineering and Construction Works; and
- Part 2: Accommodation of Traffic on Public Roads Occupied by the Contractor.

C3.2 PROJECT SPECIFICATIONS

The project specification is covered in the following sections:

ITEM	DESCRIPTION
	PROJECT SPECIFICATION PORTION 1: GENERAL
PS-1	Project Description
PS-2	Extent of the Works
PS-3	Description of the Site and Access
PS-4	Nature of Ground and Subsoil Conditions
PS-5	Construction and Management Requirements
PS-6	Construction Programme
PS-7	Site Facilities Available
PS-8	Site Facilities Required
PS-9	Existing Services
PS-10	Requirements for Accommodation of Traffic
PS-11	Occupational Health and Safety
PS-12	Adverse Weather Conditions
PS-13	Site Meetings & Reporting
PS-14	Preferential Procurement
	PROJECT SPECIFICATION PORTION 2
PSA	General
PSC	Site Clearance
PSD	Earthworks
PSDB	Earthworks (Pipe Trenches)
PSG/PSGA	Concrete (Small Works)
PSHA	Structural Steelwork
PSLC	Cable Ducts
PSLD	Sewers
PSME	Subbase
PSMJ	Segmented Paving
PSMK	Kerbing and Channelling
PSLB	Bedding (Pipes)
PSG	Concrete (Structural)
PSLE	Stormwater Drainage

PARTICULAR SPECIFICATIONS

PA	Brickwork and Plaster
PB	Carpentry, Joinery and Ironmongery
PC	Painting
PF	Valves
PES	Environmental Specification
PE	Project Specification Occupational Health & Safety Specification
PM	Immersible pump
Mp	Mechanical Works
ES	Electrical, instrumentation & generator project specification

STATUS

The Project Specification, consisting of two parts, forms an integral part of the contract and supplements the Standard Specifications.

Part A contains a general description of the works, the site and the requirements to be met.

Part B contains variations, amendments and additions to the Standardized Specifications and, if applicable, the Particular 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.

PROJECT SPECIFICATION: PORTION 1
SABS 1200 PS: GENERAL

PS-1 PROJECT DESCRIPTION

PS-1.1 Employer's Objective

The Harry Gwala District Municipality (HGDM), in its capacity as the designated Water Services Authority (WSA), has identified the urgent need to upgrade the sanitation technology serving the towns of Underberg and Himeville.

The Underberg and Himeville towns are currently served with a small-scale septic with leash field systems where containment, transport and treatment of sewage occur on site, while disposal occurs off-site. Sludge accumulated in the septic tanks are emptied by private contractors using vacuum tanker trucks (honey-suckers). The scope of this project includes the refurbishment and upgrade the existing Old Wastewater Treatment Works in Underberg.

The Employer's objective is to address the above-mentioned challenges through the defined scope of work. Upon completion, the Old Underberg WWTW will comply with current environmental and regulatory standards. This objective will be achieved by incorporating labour-intensive construction methods that promote local community participation and support Small, Medium, and Micro Enterprises (SMMEs) where applicable in the project. HGDM is committed to ensuring the success of this initiative, making it a sustainable and beneficial endeavour for all stakeholders involved.

PS-1.2 Overview of the Works

The information that follows is presented as an executive summary, outlining the major components of the scope of work at a summary level. Detailed specifications and discussions for the various components of the project are detailed and included in the discipline specific documentation that follows.

The treatment works design includes the following:

- Inlet Works Hand rake screen;
- Mechanical screen with screenings washing canal, screenings screw compactor and de-watered screenings collection bin;
- Grit removal canals;
- Ultra-sonic level detector for flow measurement and recording devices
- Side overflow weir for diverting flow;
- Venturi flume;
- Aeration tank
- Anaerobic tank
- Equalization tank;
- Secondary sedimentation;
- Chlorine disinfection;
- RAS pumpstation; and
- Sludge drying beds.
- Access road
- Maturation canal

PS-2 EXTENT OF THE WORKS

Under this contract, the successful Contractor shall execute the project in accordance with the following process upgrade specifications to achieve a design treatment capacity of 150 kL/day of sewage.

a) Determine and secure a water source for the tanker dumping solution, as the inflow and fluctuation of effluent will most probably not provide an adequate dilution stream;
b) Construct a tanker dumping unit, including a dumping pit with a coarse screen, a secondary fine screen, a holding and dilution tank with coarse bubble aeration, and a controlled outlet flow valve;
c) Construct an estimated 3 L/s pump station to achieve a controlled flow into the inlet works;
d) Empty the anaerobic tank and modify the interior to form two chambers to function as a large septic tank. The gravity flow and the controlled dump flow shall be directed to the “new” divided septic tank. Allow for re-coating of the positive-face walls to waterproof the tank and prevent aggregate exposure and reinforcement bar corrosion.
e) Empty the biological filter and convert it into a fine bubble aeration tank. This shall involve the following steps:
    i. Inspect, repair, and/or reinforce the structure, including re-coating the positive-face walls to waterproof the tank and prevent aggregate exposure and reinforcement bar corrosion;
    ii. Plug the bottom drain and air holes;
    iii. Raise the wall by approximately 1 m;
    iv. Apply an epoxy coating to the entire internal surface of the tank;
    v. Install a stainless-steel overflow channel approximately 400 mm below the top of the wall;
    vi. Install air piping and diffuser domes.
f) Remove part of the existing collapsed package plant material and install three 3 000 ℓ JoJo heavy-duty silo chemical tanks on a stand to serve as secondary sedimentation tanks, with a Chromadek cover installed above the tanks to protect them against UV damage. Install two 3 ℓ/s sludge return pumps at the tanks, comprising one duty pump and one standby pump;
g) Construct new blower room and all mechanical and electrical components required
h) Refurbish existing holding tank to serve as the emergency storage and construct new pumpstation
i) Construct new sedimentation tank including all stainless steel pipeworks and connections to RAS pumpstation
j) It is also recommended that the waterborne sewerage infrastructure intended to convey effluent from the Underberg Clinic and Underberg Primary School be inspected by CCTV to assess flow conditions and the structural integrity of the pipelines;
k) Construct new return activated sludge pumpstation building, with reinforced concrete sump. All mechanical and electrical components such pumps, MCC, etc.
l) Provide new sludge drying beds to safely manage all sludge generated by the treatment works
m) Rehabilitate the site access by upgrading it to a reinforced concrete pavement and provide a turnaround area for the honey-suckers, including a wash bay;
n) Secure the site with fencing palisade fencing, including two vehicular swing gates and one pedestrian gate;

PS-3 DESCRIPTION OF THE SITE AND ACCESS

PS-3.1 Access

The project is located within the administrative boundaries of the Dr. Nkosazana Dlamini Zuma Local Municipality, specifically situated on the south-eastern periphery of the Underberg town node. The township is located in the Dr. Nkosazana Dlamini Zuma Local Municipality, under the jurisdiction of the Harry Gwala District Municipality (HGDM), in the Province of KwaZulu-Natal.

The existing plant is situated south-east of the town of Underberg, adjacent to the uMzimkhulu River.

The co-ordinates of the site are given in Table below.

DESCRIPTION	S-COORDINATES	E-COORDINATES
Old Underberg Wastewater Treatment Works	29°47'50.72"S	29°29'53.64"E

Access to the site can be obtained by:

- From Durban: Get onto the N3 West from Durban, following signs toward Pietermaritzburg.
- Continue on the N3: Follow the N3 West past Pietermaritzburg and continue towards Mooi River /Howick.
- Take the R617 Exit: Take the exit toward Bulwer / Underberg (typically at Howick/Merrivale
- connecting you onto the R617).
- Follow the R617: Merge onto the R617, which will guide you directly through Boston and Bulwer,
- leading you straight into Underberg Town.

PS-4 NATURE OF GROUND AND SUBSOIL INVESTIGATIONS

There is no geotechnical investigation conducted for the site. The contractor may be required to get an engineering geologist specialist to conduct the geotechnical investigation.

PS-5 ENGINEERING AND DESIGN

PS-5.1 Design Services and Activity Matrix

The following matrix of responsibilities for design of permanent and temporary works will apply:

Activity Work designed by, per design stage	Responsible Party
Concept, feasibility and overall process	Employer's Agent
Basic engineering and detail layouts to tender stage	Employer's Agent
Final design approved for construction stage	Employer
Temporary works	Contractor
Permanent Works	Contractor
Preparation of as-built drawings	Contractor
Project closeout report	Employer's Agent

PS-5.2 Employer's Design

The Employer's design will be for all permanent works and will be detailed in drawings, site instructions the technical specifications to be issued with the tender documents and issued during construction.

PS-5.3 Design Brief

The contractor will be responsible for design of the following (which are all subject to approval by the Engineer):

- Site layouts for the contractor's camp and office accommodation
- Site layouts for the Engineer Representative's temporary office accommodation
- Construction Methodology
- Formwork
- All other temporary works
- Concrete Mix designs
- Mechanical testing of pumps and blowers
- All MCC panels

The costs of the designs will be deemed to have been included in the scheduled items in the Schedule of Quantities. No other additional payments will be certified to cover these activities.

PS-5.4 Drawings

The following drawings will be required to be prepared by the contractor as a minimum:

- Site layouts for the contractor's camp and office accommodation
- Site layouts for the Engineer Representative's temporary office accommodation

The costs of the designs will be deemed to have been included in the scheduled items in the Schedule of Quantities. No other additional payments will be certified to cover these activities.

The tender drawings are applicable to the contractor as detailed in Part C5 of these documents. These drawings have been used for setting up the Bills of Quantities.

PS-5.5 Design Procedures

The contractor will be required to furnish the following designs for approval by the Engineer at the indicated times:

Site layouts of the Contractor's camp and office accommodation – within 14 days from commencement date of the contract and in any case prior to the erection of the contractor's camp and offices

Layouts for the Engineer's representative office – within 14 days from commencement date of the contract and in any case prior to the erection of the Engineer's Representative's temporary office premises.

Formwork design – within 14 days of commencement of work and in any case prior to the construction of permanent reinforced concrete works.

Scaffolding and all staging work – within 14 days of commencement of work and in any case prior to the construction of permanent reinforced concrete works.

Concrete Mix Designs for all classes of concrete as measured in the Schedule of Quantities prior to the placement of any concrete work

The costs of the designs will be deemed to have been included in the scheduled items in the Schedule of Quantities. No other additional payments will be certified to cover these activities.

PS-5.6 Interface with other Contractors

The contractor may be required to provide access to other contractors undertaking work as per parallel contracts. The costs of this interface will be deemed to have been allowed for in the appropriate items in the Schedule of Quantities. No other additional payments will be certified to cover these activities.

PS-6 CONSTRUCTION AND MANAGEMENT REQUIREMENTS

PS-6.1 General

The Contractor is referred to SANS 1921: 2004: Construction and Management Requirements for Works Contracts, Part 1: General Engineering and Construction Works, and Part 2: Accommodation of Traffic on Public Roads. These specifications shall be applicable to the contract under consideration, and the Contractor shall comply with all requirements relevant to the project.
Certain aspects however require further attention as described hereafter.

PS-6.2 Quality Assurance (QA) (*Read with SANS 1921 – 1: 2004 clause 4.4)*

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

The 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.

PS-6.3 Management and disposal of water *(Read with SANS 1921-1: 2004 clause 4.6)*

The Contractor shall pay special attention to the management and disposal of water and stormwater 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 as a result of the Contractor's failure to properly manage rain and surface water, will not be considered.

PS-6.4 Disposal of spoil or surplus material *(Read with SANS 192-1: 2004 clause 4.10)*

The Contractor shall dispose all surplus and unsuitable material in legal spoil areas of his own choice. He shall be responsible for all arrangements necessary to obtain such spoil sites.

PS-6.5 Testing *(Read with SANS 1921 – 1 : 2004 clause 4.11)*

PS-6.5.1 <u>Process control</u>

The Contractor shall arrange for all tests required for process control to be done by a laboratory acceptable to and approved by the Engineer.

The Contractor may establish his own laboratory on site, or he may employ the services of an independent commercial laboratory. Whatever method is used, 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.

PS-6.5.2 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 may have further control tests carried out by a laboratory of his choice. The cost of such additional tests will be covered by a provisional sum provided in the schedule of quantities, but tests that failed to confirm compliance with the specifications, will be for the account of the Contractor.

PS-6.6 Survey beacons *(Read with SANS 1921 - 1: 2004 clause 4.15)*

The Contractor shall take special precautions to protect all permanent survey beacons or pegs such as benchmarks, 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.

PS-6.7 Existing Services *(Read with SANS 1921 - 1: 2004 clause 4.17)*

The Contractor shall make himself or herself 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.

PS-6.8 Management of the environment *(Read with SANS 1921 - 1: 2004 clause 4.19)*

The Contractor shall pay special attention to the following:

(a) Natural Vegetation

The Contractor shall confine his operation to as small an area of the site as may be practical 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.

(b) 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.

PS-6.9 Overhaul

No payment will be made for overhaul on this contract unless provision is made thereof in specific items. Long hall distance is 10km. Unless otherwise specified all haul is free haul.

PS-6.10 Excavations

Due to the depths of sewer lines and their location nets to a water course, the Contractor is to allow in their tendered rates for excavation, for shoring and protection of trenches. No additional payment will be made for protection of excavations for whatever reason.

PS-6.10 Security

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.

PS-7 CONSTRUCTION PROGRAMME

PS-7.1 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 frame as stated in the Contract Data.

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.

In determining his construction programme, the contractor should allow for disruptions/stoppages/requirements and intermittent “hold” of work while awaiting Engineer’s inspections

The contractor must take into account the above requirements when pricing and preparing the programme of works. No additional payments, other than through scheduled items, will be made for these stoppages/disruptions/constraints.

Should the contractor fail to comply with these programme requirements, the Engineer, after giving 2 days’ notice to the Contractor to comply, may order necessary work to ensure compliance, from another third party. This third party shall be paid from this contract from any monies due to the contractor.

PS-7.2 Programme in terms of Clause 5.6 of the General Conditions of Contract

It is essential that the construction programme, which shall conform in all respects to Clause 5.6 of the General Conditions of Contract, be furnished within the time stated in the Contract Data.

The preliminary programme to be submitted with the tender shall be used as basis for this programme. The Contractor's attention is also drawn to Clause 5.7.1 of the General Conditions of Contract 2025.

PS-8 SITE FACILITIES AVAILABLE

PS-8.1 Contractor's camp site and depot *(Read with SANS 1921 - 1 : 2004 clause 4.14)*

The Contractor will be permitted to locate his offices, storage facilities, workshops, latrines, etc, on a site approved by the Engineer, in liaison with the community.

Temporary buildings and fencing are to be neat and presentable, and the surrounding areas must at all times be kept in a neat, clean and orderly condition. The Contractor must not cut down or damage any trees nor make any excavation without the written permission of the Engineer and will be required to restore the site to its original condition on completion of the Works.

All buildings and latrines shall be in accordance with the Local Authority and State Heath regulations and shall be kept in a clean, sanitary condition to the satisfaction of the Engineer.

PS-8.2 Accommodation of Employees

No employees except for security guards will be allowed to sleep or be accommodated on the site in urban areas.

No housing is available for the Contractor's employees and the Contractor shall make his own arrangements to house his employees and to transport them to site.

No informal housing or squatting will be allowed.

The Contractor shall provide the necessary ablution facilities at his camp site and the site of the works for the use of his employees. Chemical toilets only will be allowed where temporary facilities must be provided.

PS 8.3 Source of Water Supply

The Contractor shall make his/her own arrangements for the supply of water for construction purposes. The source of water shall be subject to the approval of the Engineer.

The Water Services Authority in the area is Harry Gwala District Municipality. Should the contractor’s source of water be the Harry Gwala District Municipality, the contractor will be required to ensure that the water account with the Harry Gwala District Municipality is in good standing prior to the issue of completion certificate. The Engineer will withhold any payments until arrears are cleared with The Harry Gwala District Municipality.

PS 8.4 Source of Power Supply

The power supply authority is Eskom. The Contractor will be required to make his own arrangements with and pay all the requisite connection and consumption charges to Eskom for whatever temporary power supplies he/she may require for his use on the site and his tender will be held to include for all such costs and charges.

PS-9 SITE FACILITIES REQUIRED

PS-9.1 Facilities Required for the Engineer

PS 9.1.1 Temporary/Permanent Offices

The Contractor shall be asked to provide a temporary office for use by the Engineer. The offices should be able to accommodate one full time Engineer's Representative and two assistants. The offices should be of approved pre-fabricated units or similar equivalent with the following minimum specification:

- Exterior should be of chromadek make with a chromadek roof. Windows should be of aluminium and doors to be chromadek
- Interior should include oak ply cladding with vinyl flooring. Ceiling is to be white vinyl
- Air conditioning is to be provided

The Engineer's offices are to be equipped with the following as a minimum:

- Three desks each with lockable drawers
- Three high back swivel chairs
- Three visitors' chairs
- A facility to store/hang drawings
- An electric refrigerator of at least 200 litres capacity

The Contractor should also make arrangements for covered facilities to enable the accommodation of approximately 12– 16 people during progress site meetings, to be held fortnightly or monthly.

The facilities are to be provided, to the satisfaction of the Engineer, within 14 days of commencement date. Should the contractor fail to provide approved establishment within the stipulated 14 days, the contractor will pay a penalty calculated as follows:

- ***Mileage of the Engineer's Representative from other offices from the nearest business centre to site and back to office at R4.20/km***
- ***Rented Office space equivalent to that stipulated in this contract at offices in Kokstad or other places closer to the site.***

This penalty shall be deducted from the Contractor's payment certificates and paid to the service provider providing the site office of the specification as detailed above.

PS 9.1.2 Laboratory Facilities

The Contractor will not be required to provide a testing laboratory on site for use by the Engineer. However, the contractor will be required to provide compaction test results for all backfilling across roads from a recognised laboratory. The contractor will also be required to provide concrete cube test results from a recognised / approved laboratory. No additional payment will be made for the compaction tests and the contractor is to allow for the costs thereof in the tendered rates.

PS 9.1.3 Sanitary Facilities

All latrines shall conform to the requirements of the Local Authority and shall be subject to approval by the Engineer. All sanitary fees and charges due under the Local Authority or State Health Regulations or bylaws shall be paid by the Contractor. Throughout the progress of the contract, all latrines shall be maintained by the Contractor in a clean, sanitary condition to the satisfaction of the Engineer.

PS 9.1.4 Telephone Facilities

The Contractor will not be required to provide a telephone for use by the Engineer. The contractor will however be required to cover cell phone costs for the engineer’s site staff for airtime valued at R150/week. Appropriate items have been provided in the Schedule of Quantities to cover these costs.

PS 9.1.5 Housing Facilities

The Contractor will not be required to provide housing facilities for the Engineer's staff. However, a provisional sum has been provided in the schedule of quantities for payment through the contract for accommodation for the Engineer’s staff.

PS 9.1.6 Parking Facilities

The Contractor will be required to provide two covered parking bay for the Engineer.

PS 9.1.7 Engineer's Transport

The Contractor will not be required to provide transport for the Engineer’s staff.

PS 9.1.8 Security

The Contractor will be responsible for providing adequate security for the Works and for the site establishment. All costs associated with the provision of security staff shall be borne by the Contractor and should allowed for in the rates tendered for items in the Schedule of Quantities. No additional payments will be made for security measures taken during the contract period, other through the schedule items in the Schedule of Quantities.

PS 9.1.9 Contract staff to assist the Engineer

The following staff will be recruited by the contractor to assist the Engineer in carrying out his services:

Description of Staff	Nº Required	Remarks
Environmental Monitoring	One	Provisional sum provided for appointment as directed by the Engineer. Personnel directed by and report to Engineer
Occupational Health & Safety Monitoring	One	
Technical Assistant	One	
Community Liaison Officer	One	

The required personnel will be identified by the Engineer and will report to the Engineer. Provisional Sums and the relevant mark-up Items are provided for in the Schedule of Quantities to cover these costs.

PS 9.1.10 Survey Equipment

The contractor shall provide the following survey equipment, in good condition, for use by the Engineer throughout the duration of the contract:

- A dumpy level
- A theodolite
- 100m measuring tape
- An assistant, when required, to assist the Engineer to operate survey equipment, when provided.

PS 10. EXISTING SERVICES

PS 10.1 Care, Damage and Protection

Known services will be indicated in the tender and contract documents. The Contractor will be responsible for identifying all services with the relevant Service Providers.

The Contractor shall familiarize himself with all services and expose them at the start of the Contract to verify their position and establish their depths.

No additional payment will be made to the Contractor for identifying and locating services. Therefore, the Contractor will have to include the costs thereof in the scheduled items in the Schedule of Quantities.

Any information regarding existing services is given in good faith and without guarantee.

PS 10.2 Blasting

No blasting will be permitted unless the Contractor can satisfy the Engineer that his proposed blasting methods and controls are such that no damage will be caused to the adjoining building structures, pipelines or services. In any event the Engineer will require the Contractor to plan and execute each blast in such a manner as to ensure that no damage will be caused to any

structure, pipeline or service. In addition, the Engineer will require vibro-recordings to be taken at no additional cost to the Employer. No blasting is to be carried out in Eskom servitudes or wayleaves unless the Eskom authorities have been advised in writing three weeks prior to blasting. Where blasting is done adjacent to Eskom power lines, the Contractor shall arrange for a representative of Eskom to be present prior to and during any blast.

PS 10.3 Environmental Aspects

The Contractor will be required to plan and undertake his work in a manner that minimises its impact on the natural environment. Trees and other vegetation shall, wherever possible, be left undisturbed. Trees that are marked by the Engineer shall not be damaged and in the event of the Contractor doing so, a penalty will be deducted from monies due to the Contractor.

Every effort shall be made by the Contractor to prevent pollution of the adjacent areas and river and to reduce the noise, dust and fumes emanating from his construction activities.

PS 10.4 Dealing with Water

Where necessary, the Contractor shall construct temporary drainage channels to divert ground water from his excavation and excess water must be pumped out.

No compensation for any variation of the actual conditions during construction from the data given will be considered. Neither will additional compensation be considered for data omitted or inaccurately given.

The rates tendered shall allow for the requirements of this clause and all incidentals.

PS 10.5 Servitudes and Rights of Way

The Employer will, where necessary, obtain permanent servitudes and rights of way along the road routes indicated on the tender drawings. New servitudes will only be registered after completion of the Works.

PS 10.6 Dealing with Damaged Services

In the event of any service being damaged or accidentally disconnected for any reason, the Contractor shall immediately contact the relevant authority for instruction and shall report the occurrence of the incident. The damage is to be repaired as soon as possible to the approval of the Engineer and the authority. The Contractor will be held responsible for paying all costs incurred by the authority or himself as a result of each such incident, where relevant.

PS 10.7 Accommodation of Traffic

The Contractor shall always ensure the safe and expeditious passage of traffic and shall provide all necessary temporary road traffic signs, barricades, flagmen, etc to safeguard the travelling public. Any detours or bypasses constructed by the Contractor shall be adequately signposted, as per the South African Road Traffic Signs Manual, and maintained in such a manner as to provide safe and easy passage of traffic.

PS 10.8 Spoil Material

No indiscriminate spoiling of material will be allowed. All surplus or unsuitable material shall be spoiled, levelled and spread in designated areas as directed by the Engineer. All haul will be regarded as free haul.

PS 10.9 Finishing and Tidying and Defects Liability Period

On no account must rubble and spoil materials, other materials, equipment or unfinished operations be allowed to accumulate in such a manner as to unnecessarily impede the activities of other Contractors or Authorities.

Finishing and tidying must not simply be left until the end of the construction period. The Contractor will be entitled, subject to prior agreement with the Engineer and within reasonable limits, to request that work in a particular area and/or work of a particular discipline, be inspected for partial completion. The specified defects liability period in respect of any specific section of the Works shall commence on the date on which the relevant section is accepted by the Engineer as being completed, i.e. fully commissioned, including finishing and tidying.
On completion of the Contract the Contractor shall ensure that all materials used in the construction of the temporary Site office, workshop and storage yard are removed from Site. Waste materials such as construction debris and soil contaminated with oil and fuel are to be disposed of at the solid waste disposal site used approved by the Engineer. Prior to the handover of the Site to the Employer, the Contractor and the Engineer will conduct a post construction audit to determine if any additional measures that are to be taken. The Completion Certificate will only be issued after this stage.

PS 10.10 Employee Accommodation

(See Subclause 3.2.1 of Section A of Part 2 and Subclause 1.2.1 of Section A of Part 3 of SABS 0120)
The Contractor shall conform in all respects with the provisions of any Act, Regulations or By-Law of Harry Gwala District Municipality, which may be applicable to employee accommodation. Save for a security guard on active duty, no employees may be housed on Site or the Contractor's campsite after normal working hours.

PS 10.11 Employment of Local Labour

The Employer has determined that 100% of the Contractor's unskilled labour force shall be made up from the local community. A labour sub-committee (of a Project Steering Committee) comprising representatives of the community and other stakeholders will be responsible for the recruitment of all local labour. The Contractor will be required to provide details of the numbers of semi-skilled and unskilled workers he will require, together with their anticipated starting dates. The PSC through its labour sub-committee will then make this labour available to the Contractor.

A minimum of 50% of the local labour shall comprise of women and, where appropriate, disabled labour shall be employed. It is a requirement that tenderers acquaint themselves fully with requirements for registration with Unemployment Insurance Fund.

The Employer requires that the successful contractor registers all labour with the Unemployment Insurance Fund. The local labour rate to be determined by the latest EPWP rates per labourer. Manual excavations are anticipated.

During project execution, the successful contractor will be required to provide progress reports indicating to what level these requirements have been met.

PS 10.12 EPWP Construction Methods

EPWP construction methods will be utilised on this contract in order to generate employment opportunities for the local community.

PS 10.13 Frequency of Labour Wages Payments

The contractor will be required to pay labour on a fortnightly basis.

PS 10.14 Training and Capacity Building

During project execution, it is the desire of the Employer that an identified number of community members receive appropriate level of non-accredited training in either pipelaying activities or construction management activities. Within 14 days of appointment, the successful contractor will be required to provide, together with his method statement, a proposal for consideration by the Project Steering Committee for activities in which the community members can receive training. This proposal will be considered by the Project Steering Committee after which the Contractor will be given an instruction on the training to provide. Training will be provided to local labour that is already in the employ of the contractors as per clause PS 10.11. It must be noted that the Contractor will be required to pay the labour based on their daily rates indicated in PS 10.11.

A minimum of 20 person-days should be provided as non-accredited training. The contractor will be required to provide a training diary and report indicating the following to be updated monthly:

- Details of persons receiving training
- What areas there have been trained in
- Performance of the trainees
- Further training still to be done

Should the contractor fail to provide this training, the Employer reserves the right to seek training from alternative sources. In that case, the cost of the training sought will be deductible from any monies due to the contractor.

PS 10.15 Contractor Participation Goal (CPG) Partner

The Employer will require that the contractor utilise a CPG partners on the contract as part of development of emerging contractors. The CPG partners will be approved by the Employer and will be required to undertake a percentage in reference to form m: preferential Procurement under subcontracting as condition of tender item for work of the scope of work. Should the contractor be unable to provide a CPG partner, the Employer will provide one on the contract. Tenderers are also referred to Contract Data, Clause 4.4.7 in this regard.

PS-11 REQUIREMENTS FOR ACCOMMODATION OF TRAFFIC

PS-11.1 General

The Contractor will be responsible for the safe and easy passage of public traffic past and on sections of roads of which he has occupation or where work has to be done near traffic.
Accommodation of traffic, where applicable shall comply with SANS 1921-2: 2004: Construction and Management Requirements for Works Contracts, Part 2: Accommodation of Traffic on Public Roads occupied by the Contractor. The Contractor shall obtain this specification from Standards South Africa if accommodation of traffic will be involved on any part of the construction works.

PS-11.2 Basic Requirements

The travelling public shall have the right of way on public roads, and the Contractor shall make use of approved methods to control the movement of his equipment and vehicles so as not to constitute a hazard on the road.
The Contractor shall ensure that all road signs, barricades, delineators, flagmen and speed controls are effective, and that courtesy is always extended to the public.

Failure to maintain road signs, warning signs or flicker lights, etc, in a good condition shall constitute ample reason for the Engineer to suspend the work until the road signs, etc, have been repaired to his satisfaction.

The Contractor may not commence constructional activities affecting existing roads before adequate provision has been made to accommodate traffic in accordance with the requirements of this document and the South African Road Traffic Signs Manual.

The Contractor shall construct and maintain all temporary drainage works necessary for temporary deviations.

The Contractor shall provide and grant access to persons whose properties fall within or adjoin the area in which he is working.

PS-11.3 Traffic Safety Officer

Where warranted by traffic conditions on or near the site, the Contractor shall nominate a suitable member of his staff as traffic safety officer to be responsible for the arrangement and maintenance of all the measures for the accommodation of traffic for the duration of the project. Duties of the traffic safety officer shall be as set out in SANS 1921 Part 2 and shall also comply with the Occupational Health and Safety Act No 85 of 1993 and the Construction Regulations 2014.

PS-11.4 Payment

The Contractor’s tendered rates for the relevant items in the Bill of Quantities shall include full compensation for all possible additional costs which may arise from this, and no claims for extra payment due to inconvenience as a result of the modus operandi will be considered.

Items that may be considered for payment are specified in SABS 1200 Standardized Specifications and the related project specification.

PS-12 OCCUPATIONAL HEALTH AND SAFETY

(Read with SANS 1921 - 1: 2004 clause 4.14)

PS-12.1 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 No 85 and Amendment Act No 181 of 1993, and the OHSA 1993 Construction Regulations 2014 issued by the Department of Labour.

For the purpose of this contract the Contractor is required to confirm his status as mandatary 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 by executing the Agreement form C1.2.4 included in Section C1: Agreements and Contract Data.

PS-12.2 Health and Safety Specifications and Plans to be submitted at tender stage

(a) <u>Employer's Health and Safety Specification</u>

The Employer's Health and Safety Specification will be included in the tender documents as part of the Project Specifications.

(b) <u>Tenderer's Health and Safety Plan</u>

The successful Tenderer shall, on receipt of notification that he has been awarded the contract, submit without delay his own documented Health and Safety Plan for the execution of the work under the contract. His Health and Safety Plan must at least cover the following:

(i) a proper risk assessment of the works, risk items, work methods and procedures in terms of Regulations 7 to 28;
(ii) pro-active identification of potential hazards and unsafe working conditions;
(iii) provision of a safe working environment and equipment;
(iv) 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)*;
(v) 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;
(vi) 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
(vii) 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 as a result 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

PS-12.3 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.

Items that may qualify for remuneration will be specified in the Safety Specifications included or in the Project specifications.

PS-13 ADVERSE WEATHER CONDITIONS

In terms of Clause 5.12.2 of the General Conditions of Contract, extension of time will be considered for **abnormal rainfall**. The numbers of days per month on which work is expected not to be possible as a result of **normal rainfall**, and for which the Contractor shall make provision in his tendered rates, prices and programme, are listed in Table PS-13 hereafter. Only the number of days lost as a result of adverse weather conditions, exceeding the number of days listed in Table PS-13.1, will qualify for consideration of extension of time.

During the execution of the Works, the Engineer's Representative will certify a day lost due to abnormal rainfall and adverse weather conditions only:

- if no work was possible on the relevant working day on any item which is on the critical path according to the latest approved construction programme; or

- if less than 30% of the work force and plant on site could work during that specific working day.

Extension of time as a result of abnormal rainfall and adverse weather conditions shall be calculated monthly being equal to the number of working days certified by the Engineer's Representative as lost due to rainfall and adverse weather conditions, less the number of days allowed for as in Table PS-13, which could result in a negative figure for certain months. The total extension of time as a result of abnormal climatic conditions for which the Contractor may apply, shall be the cumulative algebraic sum of the monthly extensions. Should the sum thus obtained be negative, the extension of time shall be taken as nil."

Table PS-13: Expected Nº of Working Days Lost Monthly Due to Normal Rainfall

MONTH	Expected number of working days lost as result of normal rainfall
JANUARY	**5*
FEBRUARY	*5*
MARCH	*4*
APRIL	*1*
MAY	*1*
JUNE	*1*
JULY	*1*
AUGUST	*1*
SEPTEMBER	*2*
OCTOBER	*3*
NOVEMBER	*4*
DECEMBER	*5*
TOTAL	***33 days***

(Based on information obtained from the Weather Bureau, Department of Environment Affairs, Margate. The average monthly rainfall figures quoted, are included for information only, and shall not be taken into consideration for calculation of extension of time. The number of working days lost for December and January allows for the builders' holidays from 21 December 2015 and ending on 08 January 2016.)

PS-14 SITE MEETINGS AND REPORTING

The Contractor will be required to attend site meetings organised by the Engineer. In these meetings he (the Contractor) will be required to provide progress reports and other reports to monitor the outputs of the contractor, as may be required from time to time, to be presented in a format prescribed by the Engineer. The frequency of such meetings will be monthly, as a minimum. However, the frequency can be reviewed, depending on the progress of the contract.

PS-15 PREFERENTIAL PROCUREMENT

For the purpose of this contract the Contractor shall comply with the preferential procurement statement provided in F.3.11 and T2.2 of the Tender Data.

PS-16 EXPANDED PUBLIC WORKS PROGRAMME (EPWP) SPECIFICATION

The Contract shall be implemented in accordance with the Expanded Public Works Programme.

The Expanded Public Works Programme (EPWP) is a nation-wide programme to draw significant numbers of unemployed into productive work accompanied by training so that they increase their capacity to earn an income.

Opportunities for implementing the EPWP have been identified in the infrastructure, environmental, social and economic sectors. The programme is focused on unemployed, under-skilled and under-qualified persons and aims to provide an opportunity:

- To draw significant numbers of the unemployed into productive work to enable them to earn an income within the first five years of the programme.
- To provide unemployed people with education and skills within the first five years of the programme.
- To ensure those participants in the EPWP are able to translate the experience and either enabled to set up their own business/ service or become employed.
- To utilise public sector budgets to reduce and alleviate unemployment.

PS.16.1 COMMUNITY LIAISON OFFICER (CLO)

The contractor or his appointed agent will appoint a Community Liaison Officer (CLO) after consultation with the local communities, the Engineer and the Employer. The Contractor shall direct all his liaison efforts with the local communities through the appointed officer. The Contractor shall, however, accept the appointed as part of his management personnel.

1. Duties of the Community Liaison Officer

The Community Liaison Officer's duties will be:

a) To be available on site daily between the hours of 07H00 and 17H00 and at other time as the need arises. His normal working day will extend from 07H00 and 17H00 in the afternoon.
b) To determine, in consultation with the contractor, the needs of the temporary labour for relevant skills training. He will be responsible for the identification of suitable trainees and will attend one of each of the training sessions.
c) To communicate daily with the contractor and the engineer to determine the labour requirements with regard to numbers and skill, to facilitate in labour disputes and to assist in their resolution.
d) To assist in and facilitate in the recruitment of suitable temporary labour and the establishment of a "labour desk".
e) To attend all meetings in which the community and/or labour are present or are required to be represented.
f) To assist in the identification, and screening of labourers from the community in accordance with the contractor's requirements.
g) To inform temporary labour of their conditions of temporary employment and to inform temporary labourers as early as possible when their period of employment will be terminated.
h) To attend disciplinary proceedings to ensure that hearings are fair and reasonable.
i) To keep a daily written record of his interviews and community liaison.
j) To attend monthly site meetings to report on labour and RDP matters.
k) All such other duties as agreed upon between all parties concerned.
l) To submit monthly returns regarding community liaison as illustrated PS 3.12.

2. Payment for the community liaison officer

A special pay item is incorporated in Section 1200 of the Bill of Quantities relating to payment of the liaison officer on a Prime Cost Sum basis. This payment shall only be made for the period for which the duties of the liaison officer are required and not necessarily for the full duration of the contract. The remuneration of the CLO shall be determined jointly by the Contractor, Engineer and Employer.

3. Period of employment of the community liaison officer

The period of employment of the community liaison officer shall be as decided upon jointly by the Contractor, Engineer and Employer.

PS.16.2 COMMUNITY PARTICIPATION

1. Purpose

In order to give effect to the need for participation and transparency in the process of appointing labour, the community should participate in the decision making process throughout the life of a project. This shall be achieved through structured engagement between those responsible for the delivery of the project and the community.

2. Structure and Composition

A Project Liaison Committee (PLC) may be formed from representatives of the Employer, the Engineer, the Contractor and the Community if the project is such that a specific community can be identified.

3. Procedures

a) The PLC deals with labour and SMME involvement on the project and shall meet at least once every month until such time as it is of the opinion that it could fulfil its tasks by meeting less frequently.

b) The PLC shall make recommendations by consensus. If consensus can not be reached, the decision of the Employer will be final in cases that have no financial implications for the Contractor or where payment is to be made from PC items. Where the financial responsibility for the successful completion of the works rests with the Contractor, the Contractor's decision shall be final. In fulfilling its tasks, the PLC shall be guided by the relevant sections of this specification and the supplementary documents.

4. Tasks of the PLC

a) To assist with community liaison and resolution of disputes.

b) To devise fair and transparent procedures that will assist the Contractor in the engagement of labour and the award of sub-contracts to SMME's.

c) To advise on and monitor labour issues.

d) To assist in resolving labour disputes.

5. Assistance to the PLC

a) The Employer may appoint a competent local person as a Community Liaison Officer to assist the Engineer and the Contractor in the day-to-day liaison with the communities directly affected by the project.

PS. 16.3. UNEMPLOYMENT INSURANCE FUND

The Contractor will be responsible for payment or contribution of UIF for all labour employed under the project. Proof of payment of UIF shall be available upon request.

PS.16.4 WORKMEN'S COMPENSATION ACT

All labour employed on the site shall be covered by the Workmen's Compensation Act. The contractor shall pay in full, including the payment of the necessary levies, such amounts, as are due in terms of the Act. The contractor at the commencement of the contract shall resolve the manner in which Workmen's Compensation will be handled. Amounts paid by the contractor shall not be included in the wage rates but shall be an extra payment allowed for by the contractor.

PS.16.5 LABOUR INTENSIVE METHODS

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 bringing about the effective substitution of labour for plant and equipment.

Appropriate portions of the Works included in the Contract shall be executed using labour-intensive construction methods.

Except where the use of plant is essential in order, in the opinion of the Engineer, to meet the specified requirements by the Due Completion Date, or where the use of plant is essential as a result of occupational health and safety considerations, the Contractor shall use only hand tools and equipment in the construction of those portions of the Works that are required in terms of these Project Specifications to be constructed using labour-intensive construction methods.

These portions of the Works shall be constructed utilizing only locally employed labour and/or the labour of local subcontractors, supplemented by the Contractor's key personnel to the extent necessary and unavoidable, unless otherwise instructed by the Engineer and in accordance with the further provisions of the relevant sections of Portion B of the Project Specifications.

Subject to considerations of occupational health and safety, the portions of the Works to be executed using labour-intensive construction methods are:

- Clearing and grubbing of the Site;
- Excavation for structures up to 1,5 m deep;
- Bedding, selected fill, backfilling and compaction of all pipe trenches irrespective of depth, but assisted by mechanical compaction equipment in order to achieve the specified densities;
- Transportation and spoiling of all trench materials, where the disposal site is located within 20 metres of the source;
- Dismantling and re-erection of fences;
- Mixing and placing of concrete;
- Construction of all brickwork required for structures; and
- Cleaning and tidying up of the Site.

PS.16.6 MATERIAL

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

Where possible, the contractor shall source material from within 1.5 km of the site utilizing local labour. The material which may be sourced from site includes:

- Rock for gabions and stone pitching.

PS.16.7 TASK BASED ACTIVITIES

Labour Intensive activities are to be planned as task-based works where required. Task based refers to a specific amount of work to be performed which is clearly defined by a quantity and quality. Typically, a particular task can be completed within a working day.

PS.16.8 PROJECT SPECIFICATIONS

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.

PS.16.9 EMPLOYMENT OF UNSKILLED AND SEMI-SKILLED WORKERS IN LABOUR INTENSIVE WORKS

Requirements for the sourcing and engagement of labour.

a) 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.
b) The rate of pay set for the EPWP is R 245.00 per day.
c) Tasks established by the contractor must be such that:
    i) the average worker completes 5 tasks per week in 40 hours or less; and
    ii) the weakest worker completes 5 tasks per week in 55 hours or less.
d) 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 in c).
e) 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:
    i) where the head of the household has less than a primary school education;
    ii) that have less than one full-time person earning an income;
    iii) where subsistence agriculture is the source of income.
    iv) those who are not in receipt of any social security pension income.
f) The Contractor shall endeavour to ensure that the expenditure on the employment of temporary workers is in the following proportions:
    i) a) 55 % women;
    ii) 55% youth who are between the ages of 18 and 35; and
    iii) 2% on persons with disabilities.

PS.16.10 BASIC CONSTRUCTION METHODS

Add the following:

"in all cases where soft founding materials is classified as suitable for culvert beddings construction, the in-situ material shall be ripped, moistened and compacted to 90& to 93% modified AASHTO density. The depth of preparation and compaction of founding material shall be indicated on drawings as specified by the engineer. Allowance for measurement and payment for this work is made in the bill of quantities under this section"

Contracts- Part 5: Earthworks Activities" which are to be performed by hand and should be included in the scope of works without amendment or modification as set out below.

1. SCOPE

This specification establishes general requirements for activities which are to be executed by hand involving the following:

a) Trenches having a depth of less than 1.5 metres
b) Stormwater drainage
c) Low-volume roads & sidewalks

2. PRECEDENCE

Where this specification is in conflict with any other standard or specification referred to in the scope of works to this contract, the requirements of this specification shall prevail.

3. HAND EXCAVATABLE MATERIAL

Hand excavatable material is material:

a) granular materials:
   i. whose consistency when profiled may in terms of table 1 be classified as very loose, loose, medium dense, or dense; or
   ii. where the material is a gravel having a maximum particle size of 10mm and contains no cobbles or isolated boulders, no more than 15 blows of a dynamic cone penetrometer is required to penetrate 100mm;

b) cohesive materials:
   i. whose consistency when profiled may in terms of table 1 be classified as very soft, soft, firm, stiff and stiff / very stiff; or
   ii. where the material is a gravel having a maximum particle size of 10mm and contains no cobbles or isolated boulders, no more than 8 blows of a dynamic cone penetrometer is required to penetrate 100mm;

1) A boulder, a cobble and gravel is material with a particle size greater than 200mm, between 60 and 200mm.

2) A dynamic cone penetrometer is an instrument used to measure the insitu shear resistance of a soil comprising a drop weight of approximately 10 kg which falls through a height of 400mm and drives a cone having a maximum diameter of 20mm (cone angle

of 60° with resepect to the horizontal) into the material being used.

Table 1: Consistency of materials when profiled

GRANULAR MATERIALS		COHESIVE MATERIALS	
CONSISTENCY	DESCRIPTION	CONSISTENCY	DESCRIPTION
Very loose	Crumbles very easily when scraped with a geological pick.	Very soft	Geological pick head can easily be pushed in as far as the shaft of the handle.
Loose	Small resistance to penetration by sharp end of a geological pick.	Soft	Easily dented by thumb; sharp end of a geological pick can be pushed in 30-40 mm; can be moulded by fingers with some pressure.
Medium dense	Considerable resistance to penetration by sharp end of a geological pick.	Firm	Indented by thumb with effort; sharp end of geological pick can be pushed in upto 10 mm; very difficult to mould with fingers; can just be penetrated with an ordinary hand spade.
Dense	Very high resistance to penetration by the sharp end of geological pick; requires many blows for excavation.	Stiff	Can be indented by thumb-nail; slight indentation produced by pushing geological pick point into soil; cannot be moulded by fingers.
Very dense	High resistance to repeated blows of a geological pick.	Very stiff	Indented by thumb-nail with difficulty; slight indentation produced by blow of a geological pick point.

Trench excavation

All hand excavateable material in trenches having a depth of less than 1,5 metres shall be excavated by hand.

Compaction of backfilling to trenches (areas not subject to traffic)

Backfilling to trenches shall be placed in layers of thickness (before compaction) not exceeding 100mm. Each layer shall be compacted using hand stampers

a) to 90% Proctor density;

b) such that in excess of 5 blows of a dynamic come penetrometer (DCP) is required to penetrate 100 mm of the backfill, provided that backfill does not comprise more than 10% gravel of size less than 10mm and contains no isolated boulders, or

c) such that the density of the compacted trench backfill is not less than that of the surrounding undisturbed soil when tested comparatively with a DCP.

Excavation

All hand excavateable material including topsoil classified as hand excavateable shall be excavated by hand. Harder material may be loosened by mechanical means prior to excavation by hand.

The excavation of any material which presents the possibility of danger or injury to workers shall not be excavated by hand.

4. MEASUREMENT AND PAYMENT

Measurement shall be as specified for pay item of the standard specifications.

The tendered rate shall include full compensation for carrying out the excavation by hand where circumstances prevent the use of mechanical excavators.

PS.16.11 PROVISION OF STRUCTURED TRAINING

1. SCOPE

This specification covers the requirements for the provision of structured training to be arranged by the contractor over the period of this contract.

2. GENERIC TRAINING

a) The contractor shall, from the commencement of the contract, implement a structured progressive training programme.

b) The generic training will inter alia comprise, but not be limited to the following subjects:

Course Description	Estimated No. Of Trainees	Estimated Duration (Days)
1. Bricklaying	5	10
2. Plastering	3	10
3. Plumbing	2	10
4. Electrical Work	2	10
5. Concrete Work	4	10

c) Training shall be at or by an approved accredited organisation and shall be delivered by suitably qualified and experienced trainers.

d) The tenderer shall provide with his tender full details of the structured training programme he intends to implement, which details shall include the following:
   i) The name of the training institution and programme
   ii) The manner in which the training is to be delivered.
   iii) The numbers and details of the trainers

e) Such details shall include the above-mentioned details in Form.

f) The contractor shall be responsible for the provision of everything necessary for the delivery of the generic training programme, including the following:
   i) A suitable venue with sufficient furniture, lighting and power.
   ii) All necessary stationery consumables and study material
   iii) Transport of the students (as necessary)
   iv) Payment of wage to all trainees during the classroom training at a rate equal to the minimum wage as set in the Ministerial Determination for the Expanded Public Works Programme on an annual basis.
   v) relevant PPE required for the project works
   vi) Additional supervision of learners during the practical learning stages of the works. Wage for the leaners during this stage of the training will be paid through the outputs.

g) Generic training courses shall commence within one month of possession of site and be completed before the end of the contract period.

h) The contractor's training programme shall be subject to the approval of the engineer, and the contractor shall if so instructed by the engineer alter or amend the programme and course content if a need is identified once the contract commences.

i) The contractor shall keep comprehensive records of the training given to each student and whenever required shall provide copies of such records to the engineer. At the successful completion of each course each student shall be issued with a certificate indicating the course contents as proof of attendance and completion.

In addition to the above, a monthly return shall be submitted by the contractor. An example of the form is illustrated in PS 3.12 of this document.

3. IN SERVICE TRAINING

The contractor shall in addition to the structured (accredited) training as provided for in Part C of this document implement an in-service training programme, from the commencement of the contract, in which the various skills required for the execution and completion of the works are imparted to the labourers engaged thereon, in a programmed and progressive manner. Labourers shall be trained progressively throughout the duration of the contract, in the various stages of a particular type of work.

3.1 Details of in-service training for local people

a) The contractor shall attach to applicable returnable form the basic details of his proposed in- service training programme, which details shall inter alia include the following:
   1. the details of training to be provided
   2. the manner in which the training is to be delivered
   3. the number and details of trainers to be utilised.

b) The in-service training programme shall be submitted with the initial works programme. The progress in relation to this programme will be recorded monthly and attached to the site meeting minutes and payment certificate.

c) The contractor shall provide onsite, sufficient skilled and competent trainers to train all labourers engaged on the contract, in the various skills required for the execution and completion of the works.

d) All labourers shall be remunerated in respect of all time spent undergoing training.

e) Every worker engaged on the contract shall on the termination of his participation on the contract, be entitled to receive from the contractor, a certificate of service in which the following information shall be recorded:
   1. the name of the contractor
   2. the name of the employee
   3. the name of the project/contract
   4. the nature of the work satisfactorily executed by the worker and the time spent thereon
   5. the nature and extent of training provided to the worker
   6. the dates of service.

f) The cost of the above obligations shall be deemed to be covered by the sums and rates tendered for items in the bill of quantities. The performance of the contractor in providing in-service training, shall be taken into consideration should the contractor fail to reach his CPG at the completion of the project.

3.2 Lead time for training

The training of labour as specified shall, as far as possible, take place before commencement of each activity and the contractor shall take into account in his programme the lead-time he requires for such training. All training herein specified shall be deemed to be a construction activity and a non-negotiable condition of the contract".

All formal training is to be documented in terms of the National/Provincial submission forms and accompanied by an attendance register for the applicable days.

5. MEASUREMENT AND PAYMENT

The prime cost sums are provided to cover the actual costs (including wages, tools and PPE) for attendance of accredited training courses as agreed with the engineer and shall be expended in accordance with the provisions of sub-clause 48(2) of the general conditions of contract. The tendered percentage in sub-item 4.1(c) is a percentage of the amount actually spent under sub-items 4.1(a) and (b) which shall include full compensation for the contractor's handling cost, profit, mentoring, record keeping, reporting and all other costs in connection therewith.

The lump sum tendered for 4.1(d) (Training Venue) shall include full compensation for the provision of the training venue, for all necessary lighting, power, furniture, stationery, consumables and study material and for transportation of the students to and from the training venue. Payment of the lump sum will be made in two instalments as follows:

a) The first instalment, 75% of the lump sum, will be paid after the contractor has met all his obligations regarding the provision of the training venue as specified.

I. The second and final instalment, 25% of the lump sum, will be paid after the provision of all the accredit training as specified in the document.

The lump sum tendered for 4.1 (e) (Transport and Accommodation of Workers) shall include full compensation for the provision of additional supervisory staff to manage the output generated from the learners during practical training.

PS.16.12 JOB CREATION REPORTING FOR EPWP

In order to assist the Employer in complying with the goals of creating EPWP job opportunities, the Contractor must provide the following information for reporting purposes:

A. Type of project data required per project

Every EPWP project shall collect and keep specific project data for the purpose of EPWP progress reporting. The data that is required to be kept and maintained for each project includes:

i. Beneficiary Data

A beneficiary list must be maintained for every project. The data required in this beneficiary list is indicated below. This data shall be recorded, checked and signed off by the Contractor on a weekly basis, and shall be submitted to the Employer at each monthly site meeting. The beneficiary list shall contain the following data and shall be kept and maintained on site for audit purposes:

1. Beneficiary identity – name, surname, initials, date of birth and identity number (or other unique identifier) plus certified copy of ID book (or other unique identifier).
2. Beneficiary profiles – nationality, gender, age, education level and disability status.
3. Monthly work data for beneficiaries – daily wage to be received, number of calendar days training attended and number of calendar days worked.

ii. Project work data

This generally seeks to confirm the number of people at work daily on the project. The following data must be recorded and maintained on site by the Contractor, in order that it can be provided by the Employer to the National Department of Public Works upon request when the latter is undertaking sample auditing. The documentation that should be kept includes:

1. Daily attendance register – register for each day showing all the workers that were registered as being at work on that day. Attendance registers shall be completed on site on a daily basis and signed off by the Contractor on a weekly basis.
2. Summary of monthly attendance.

iii. **Project payment data**

This generally seeks to confirm what was paid, for how much work and to whom. It is required that the Contractor adopt one of the following methods as standard procedure for recording and maintaining this information:

1. Payment register – this is a list of the workers showing the wages paid to each worker and signed off by each worker as proof of receipt and acceptance of payment. Information on this register must include the name of the worker, either an identity number or other unique identifier, the number of calendar days that the pay period covers, the wage rate and the total wages paid.

Alternatively,

2. Bank records showing the transfers to each worker account, signed off by the Contractor as proof of payment – these bank records must specifically show the name of the worker, either an identity number or other unique identifier, the period which the pay covers and the total wages paid.

The project payment data, as recorded and maintained by the Contractor in terms of either (a) or (b) above, must be available and applicable for the entire period for which the Employer claims an incentive reward for person-days of work created in terms of the project.

iv. F4.1.4 Employment output data

The Contractor shall submit to the Employer at each monthly site meeting the data necessary to enable the Employer to calculate the following employment output data:

1. Number of work opportunities created (where one work opportunity = paid work created for one individual on an EPWP project, for any period of time).
2. Number of person-days of work created (where one person-day = one day of work carried out by one individual). The total number of person-days of work created on a particular EPWP project shall be
3. obtained by summing the total number of person-days worked by each individual employed during the course of that EPWP project.
4. Number of Full-Time Equivalents (FTEs) created (= total number of person-days of work created on the EPWP project divided by 230 working days). In terms of EPWP policy, one year of work created for one individual is assumed to comprise a total of 230 days of paid work carried out by that individual.
5. Average duration of work opportunities created (= total number of person-days of work created on the EPWP project divided by the number of work opportunities created on that EPWP project).
6. Average daily wage rates paid (= accumulated total of the wages paid to all individuals employed on an EPWP project divided by the total number of person-days of work created on that EPWP project

HARRY GWALA DISTRICT MUNICIPALITY

UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)
HGDM902/HGDM/2026

Labour Return: (Current Month)

	Total		Adults				Youth (<35 yrs)				Disabled			
			Women		Men		Female		Male		Female		Male	
	Persons	Person days	Persons	Person days	Persons	Person days	Persons	Person days	Persons	Person days	Persons	Person days	Persons	Person days
Clerical	0	0												
Labourers	0	0												
Managerial	0	0												
Semi-skilled	0	0												
Skilled	0	0												
Supervisor	0	0												
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Expenditure

(All excl. VAT)

	Previous Total	This Cert	Total to Date
Value paid to locally sourced labour resources			R -
Amount paid for accredited training			R -
Amount paid for non-accredited training			R -

SMME Schedule

Name of SMME	SMME Information		Project Information			
	No of Permanent Employees	Turnover previous 12 months	Total person days to date	Amount paid to SMME	Person days locally sourced	Total value of work

PROJECT SPECIFICATION: PORTION 2

AMENDMENTS TO THE STANDARD AND PARTICULAR SPECIFICATIONS

INTRODUCTION

In certain clauses the standard, standardized and particular specifications allow a choice to be specified in the project specifications between alternative materials or methods of construction and for additional requirements to be specified to suit a particular contract. Details of such alternative or additional requirements applicable to this contract are contained in this part of the project specifications. It also contains additional specifications required for this particular contract.

The number of each clause and each payment item in this part of the project specifications consists of the prefix PS followed by a number corresponding to the number of the relevant clause or payment item in the standard specifications. The number of a new clause or payment item, which does not form part of a clause or a payment item in the standard specifications and which is included here, is also prefixed by PS, but followed by a new number which follows on the last clause or item number used in the relevant section of the standard specifications.

SABS 1200 PSA: GENERAL

PS A 3 MATERIALS

All the Contractor's suppliers are to be approved and inspected by the Engineer before they are engaged.

PS A 3.1 QUALITY

Where there is a standardised mark programme for any material, all such material supplied shall bear the official standardisation mark. The Engineer's approval is based on tests conducted by the Contractor as required by this Contract.

All materials proposed by the Contractor for incorporation into the work shall where required, be tested in accordance with the Specification. The Contractor is responsible for the cost of all testing to ascertain that the materials do comply with the relevant minimum requirements and all such costs shall be deemed to be included in the tendered rates. The cost of control tests done by the Engineer and for which the result to not comply with the minimum requirements shall be for the Contractor's account.

All test results shall be submitted to the Engineer for approval prior to such materials being built into the works. No material shall be built into the works without such approval. All costs involved in this testing shall be deemed to be included in the rates tendered.

The Contractor shall inform the Engineer of any control testing to be done at least 48 hours before such tests are required and must allow in his program for the time necessary for the tests and the processing of the results thereof.

The handling, storage, transport and erection of equipment, machinery and materials shall be strictly in accordance with the requirements of the supplier and/or manufacturer.

All materials shall be new and of the best quality available unless otherwise specified. They must function satisfactorily under the prevailing climate and weather conditions at the place of installations.

The Contractor is totally responsible for the implementation of an approved QA system equivalent to ISO 9000. The system shall be submitted to the Engineer for approval within 14 days of the start of the Contract and shall define methods to ensure that all necessary quality standards are attained. The Engineer will audit the applications of the QA system on a regular basis during this Contract.

PSA 4 PLANT

All plant provided by the Contractor for the execution and maintenance of the works shall be of a character comparable with the scope of the works.

The Contractor shall provide and maintain sufficient plant to meet all contractual requirements and shall not remove any of this plant from the site without the written permission of the Engineer. He shall, however, remove unsuitable, obsolete or worn-out plant from the site when ordered to do so by the Engineer and replace these with plant approved by the Engineer.
The approval of any plant on the site by the Engineer shall in no way relieve the Contractor of any of his obligations under the Contract.

PS A 4.2 Contractor's Offices, Stores and Resources

Add the following to A 4.2:

No housing is available for the Contractor's employees and the contractor must make his own arrangements for accommodation and transport of his employees.

PS A 4.3 Hand Tools

The contractor shall provide and maintain all hand tools required for the execution of the Works.

PS A 5 CONSTRUCTION

On completion of the scope of work associated with each construction drawing, the Contractor shall provide a marked-up "as-built" copy of the drawing. These drawings shall incorporate all changes, amendments and additions that have occurred and the drawings shall be signed by the Contractor's representative and submitted to the Engineer for signature and acceptance.

Where surveying is necessary to determine as-built conditions, the Contractor shall provide a land surveyor on Site to undertake the as-built survey within 24 hours of being so instructed by the Engineer.

PS A 5.1. Survey

PS A 5.1.1 Setting out of the Works

Substitute the first sentence in A 5.1.1 with the following:

Setting out of the work is the sole responsibility of the Contractor and shall be done from the layouts given to him. The proposed structures must be placed 2,0m away from the ERF boundaries in the road reserve. Any discrepancy shall immediately be reported in writing to the Engineer. Any costs or subsequent costs arising from discrepancies, which had not been reported to the Engineer, shall be the sole responsibility of the Contractor. The exact position of the network pipes shall be determined on site in conjunction with the Engineer and must be approved before construction of the specific section starts.

The Engineer may alter any part of the works to suit the local conditions. The Contractor must therefore contact the Engineer immediately after the preliminary setting out of any part of the works before starting with detail setting out, or construction. Only after the Engineer has approved a specific site or part of works, may the detail setting out and construction commence.

PS A 5.2 Watching, Barricading, Lighting and Traffic Crossings

Add the following to A 5.2.

The crossing of existing tar and dirt roads must be done in half widths, while the total traffic is accommodated on the other lane.

Road traffic signs shall comply with the requirements of the “South African Road Traffic Signs Manual” and shall be approved by the Engineer before construction commences.

PS A 5.9 Transporting Of Materials

Where the transporting of materials outside of the site is such as to generate a nuisance, the material shall be covered during transport.

Precautions shall be taken during the transporting of muddy and other materials to prevent its fouling completed construction or roads. Any rock or debris falling from trucks on to roads shall be removed immediately.

Access Roads to Site - The Contractor shall keep in good and constant repair all access roads to and on the site.

Any route that the Contractor wishes to use to the place where water is obtained or any other route that is used by the Contractor shall be subject to approval by the Engineer. All the Contractor’s vehicles on the Site must be in a roadworthy condition. The number of the Contractor’s vehicles on the Site will be subject to approval by the Engineer.

PS A 7 TESTING

PS A 7.2 Approved Laboratories

The Contractor may appoint an accredited independent testing laboratory to the approval of the Engineer. The Engineer shall be given free access to any appointed laboratory.

PS A 7.4 Statistical Analysis of Control Tests

Substitute A 7.4 with the following:

Test results shall not be evaluated by statistical methods. All results shall comply with the specified minimum requirements of the materials concerned.

PS A 8 MEASUREMENT AND PAYMENT

PS A 8.1.2.3 The Contractor to Price all Items

In addition, the *Contractor* shall provide a detailed schedule itemising the breakdown of each item listed in the Preliminary and General section of the Schedule of Quantities, in terms of all personnel, plant, structures, facilities etc. not covered by the construction rates elsewhere in the schedule. The rate for each item in the detailed schedule shall cover all direct and overhead costs, profit and all other costs for provision of the item.

PS A 8.2.2 Time-Related Items

The tendered amount for a time-related item will be increased; if any extension of time for the completion of the works is awarded on the condition that the activity related to the item tendered for must be sustained during the extended period.

The ratio between the increased amount for a time-related item and the tendered amount must be the same as the ratio between the extension of the time period for the completion of the works and the original time period allowed for completion of the works.

If the works is completed before the end of the original time period allowed for completion of the works, the tendered amount of time related item that is influenced by the earlier completion would be reduced similarly.

PS A 8.3 Fixed Charge and Value-Related Items

PS A8.3.1 Contractual Requirements ……..
Unit: Sum

The sum shall cover the Contractor's initial costs of providing sureties, insurance of the works and plant, third party or public liability insurance and unemployment insurance to cover his compliance with the requirements of the Workmen's Compensation Act, 1941 (Act No. 30 of 1941) and any other initial financing obligations of a preliminary and general nature, such contributions of the CEITB.

The tendered amounts for fixed charge and value related items will not be increased, if extension of time for the completion of the works is awarded.

PS A 8.3.2 Establishment of Facilities on the Site

PS A 8.3.2.1 Facilities for Engineer

a) Furnished office (No)
   Unit: Sum
b) Communication Costs (No)
   Unit: Sum
c) Nameboards (No)
   Unit: Sum
d) Computer facilities complete with printer, modem with 4G connection (No)
   Unit: Sum

e) Provision of survey equipment (No)
Unit: Sum

PS A 8.3.2.2 Facilities for Contractor

a) Offices and storage sheds
Unit: Sum
b) Workshops
Unit: Sum
c) Laboratories
Unit: Sum
d) Ablution and latrine facilities
Unit: Sum
e) Tools and equipment
Unit: Sum
f) Water supplies, electric power and communications
Unit: Sum
g) Dealing with water
Unit: Sum
h) Access
Unit: Sum
i) Plant
Unit: Sum

PS A 8.3.3. Other Fixed Charge Obligations

This item as listed under Schedule A of the Bill of Quantities is as specified in the standardized specification SANS 1200 A.

PSA 8.3.3.1

Issuing of notices to consumers
Unit: Sum

PSA 8.3.3.2 OHS Act Obligations

I. General Safety obligations (incl. provision of personal protective equipment)
Unit: Sum
II. Health and Safety plan/file including health and safety training
Unit: Sum

PSA 8.3.3.3

Environmental Management Plan Obligations
Unit: Sum

PS A 8.3.4 Removal of Site Establishment

The sum shall cover the cost of the demolition on and the removal from the surface of the site of all items established in terms of 8.3.2 and 8.3.3, and shall provide for the making good and the restoring of the site to the satisfaction of the Engineer.

PS A B 8.3.5 Occupational Health and Safety

PS A B.8.3.5.1 Contractor's initial obligations in respect of the Occupation Health and Safety Act and Contractual Regulations

……..Unit: Sum

The amount will be paid on the scheduled rate on condition that:

- The contractor has notified the Provincial Director of the Department of Labour in writing of the project.
- The client has approved the contractor's Health and Safety Plan.
- The contractor has set up his Health and Safety File and Safety Plan.
- The contractor has appointed a Health and Safety Officer.

The provisional sum shall represent full compensation for that part of the contractor's general obligations in terms of Occupational Health and Safety Act and the Construction Regulation which are mainly a function of time. The sum for the supply of all safety clothing, first aid kit, etc. in order to adhere to the occupational Health and Safety Act specifications. The Contractor must familiarize himself with the conditions as per Occupational Health and Safety Act and adhere thereto. The rate shall cover the Contractor's overheads, changes, and profit payments for the service Provider. Contractor to note that this item covers the costs for the preparation and submission of Health and Safety plan and file.

Payment shall be as specified for item 1.3 in the standard specifications.

PS A B.8.3.5.2 Occupational Health and Safety Act …… Unit: Sum

Handling cost in respect of sub-item 8.3.5. A percentage of the payment made to the Occupational Health and Safety Act will be paid to the contractor under this section. The rate shall cover the Contractor's overheads, changes, and profit on payments for the Occupational Health and Safety Act.

- **Provision of Safety Officer**

The Contractor should appoint the safety officer who will be fulltime responsible for all safety issues on site, and he or she should be fulltime on site.

The tendered rates include the full compensation for that part of the provision of safety officer in terms of the Occupational Health and Safety Act and the Construction Regulation which are mainly a function of time. Payment shall be made monthly.

- Handling cost in respect of sub-item 8.3.5.2 (a). A per percentage of the payment made to the Safety Officer will be paid to the Contractor. The rate shall cover the Contractor's overheads, changes and profit on payments for the Safety Officer.

PS A B.8.3.5.3 Contractor's time related obligation in respect of the OH & S Act and Construction Regulation

The tendered lump sum shall represent full compensation for that part of the contractor's general obligations in terms of Occupational Health and Safety Act and the Construction Regulations which are mainly a function of time. The lump sum will be paid monthly only after payment for item 1.3.3 and item 1.1.5 has been made. Payment of the lumpsum shall be made monthly (calculated by the division of the lumpsum by the number of months remaining).

PS A 8.4 SCHEDULED TIME RELATED ITEMS

PS A 8.4.2.1 Facilities for Engineer

a) Engineers' office (No)
   Unit: Month
b) Communication Costs (No)
   Unit: Month
c) Nameboards (No)
   Unit: Month
d) Provision of survey equipment (No)
   Unit: Month

PS A 8.4.2.2 Facilities for Contractor

The sum shall cover the Contractor's initial costs of providing sureties, insurance of the works and plant, third party or public liability insurance and unemployment insurance to cover his compliance with the requirements of the Workmen's Compensation Act, 1941 (Act No. 30 of 1941) and any other initial financing obligations of a general and preliminary nature, such contributions to the CEITB. Establishment of Facilities on the Site Facilities for Engineer.

PS A 8.4.3 Supervision for Duration of Construction

The sum shall cover the costs of on-site supervision and such local administration as the Contractor considers necessary for the proper completion of the Works, and shall cover the cost of the salaries, wages and allowances paid to the site agent, general foreman, section foreman (where applicable), site surveyors, timekeepers, assistants and other site supervisory staff, and of transport incurred in connection with such staff. Plant (designated plant or plant for designated operations or plant for use during Supervision for Duration of Construction)

PS 8.4.4. Company and Head Office Overhead Costs for the Duration of the Contract Unit: Sum

The sum shall cover the contractor's company and head office overhead costs.

PS A 8.5 Sums Stated Provisionally By Engineer

PS A 8.5. (a) 1 Community Liaison Officer **Unit: Sum**

The Contractor must pay a salary to a person appointed as the Community Liaison Officer for the project. The amount of payment and payment dates will be determined as soon as the Community Liaison Officer is appointed.

PSA 8.5(a) 2 PSC Meetings Attendance **Unit: Sum**

The tendered rate shall cover the compensation of all members of Project Steering Committee for attending meetings. The amount of payment and payment dates will be determined on the commencement date of the project. The Engineer should authorize payment before it is made. Proof of payment has to be submitted to the Engineer before claim can be certified.

PS A 8.5(a) 3 Overheads, Charges and Profit on (1) above **Unit %**

Handling costs and profit in respect of sub-item 8.5 (a) 1 & 1. A percentage made to the Community Liaison Officer and PSC Meeting attendance will be paid to the contractor. The rate shall cover the Contractor's overheads, charges and profit on payments for the Community Liaison Officer and PSC members.

PS A 8.5(b) 1 Training

Provisional sum for training services supplied by the Training Company. The name and contact details of the Training Company, to be appointed by the Contractor, will be supplied to the Contractor by the Employer or Engineer.

PS A 8.5(b) 2 Overheads, charges and profit on (1) above

Handling costs and profit in respect of sub-item 8.5 (b) 1. A percentage of the payment to the Training Company will be paid to the Contractor. The rate shall cover the Contractor's overheads, changes, and profit on payments for the Training Company. No payment will be made under this item before any payment is made to the Training Company.

PS A 8.5 Existing Services

The services parallel to the pipeline routes must only be removed and re-erected at the positions as indicated and approved by the Engineer and repaired where it was damaged. When the pipeline routes across the fencing or gates temporary wire gates must be provided that must be kept closed. After completion of the work these fences or gates must be repaired to the same condition as before commencement of the work.

PS A 8.5(c)2 Overheads, changes and profit from (1) above **Unit: %**

Handling cost in respect of sub-item 8.5 (c) 1. A percentage of the payment made to the service provider will be paid to the Contractor. The rate shall cover the contractor's overheads, changes, and profit on payments for the Service Provider.

PS A 8.7 Daywork

Replace A 8.7 with the following:

Daywork will be paid according to the percentage allowance method. For calculating the total remuneration, the General Conditions of Contract for Construction Works, Fourth Edition, 2025 shall apply, with the amendments as in the appropriate special conditions of contract, which is bound into this document. A daywork schedule will be provided for filling in the necessary information.

PROJECT SPECIFICATION: PORTION 2

SABS 1200 PSC: SITE CLEARANCE

PS C 3 MATERIALS

PS C 3.1 Disposal of Material

Substitute the first sentence of C 3.1 with the following:

Material obtained from clearing and grubbing shall be disposed of at the site indicated at the site inspection. If such a site is indicated at the tender stage, the cost of transporting material and debris will be included under 8.2.1.

Loading and off-loading should be done by hand and the contractor must price accordingly under item 8.2.1.

PS C 5 CONSTRUCTION

PS C 5.1 Areas to be cleared and grubbed

Substitute the first sentence of C 5.1 with the following:

Unless otherwise indicated by the Engineer, clearing and grubbing are limited to a 2,0m wide strip along the pipe route. Measurement and payment for clearing and grubbing shall only occur for areas as required in writing by the Engineer.

The Contractor may proceed with clearing and grubbing after the handing over of the site.

The site must be cleared and topsoil shall be removed to a depth of 200 mm and stockpile on site or as indicated by the Representative of the client.

PS C 5.2 Cutting of Trees

PS C 5.2.3 Preservation of Trees

PS C 5.2.3.2 Individual Trees

Add the following to C 5.2.3.2:

Trees outside pipeline routes must be left standing and undamaged, except where otherwise ordered in writing by the Engineer.

A penalty of **R15 000,00** per tree for trees damaged and/or removed will be charged.

PS C 5.9 Existing fencing

The fencing parallel to the pipeline routes must only be removed and re-erected at the positions as indicated and approved by the Engineer and repaired where it was damaged. When the pipeline routes cross fencing or gates temporary wire gates must be provided that must be kept closed. After completion of the work these fences or gates must be repaired to the same condition as before commencement of work.

PS C 8 MEASUREMENT AND PAYMENT

PS C 8.2 Scheduled Items

PS C 8.2.1 Clear and grub (1.0m wide) Unit: m

The removal of all rocks and boulders on site over 0.15 m^3 will be paid under sub-clause D 8.3.2 (b). The removal of hard rocks other than boulders will be paid under the sub-clause PS DB 8.3.2 (b).

PS C 8.2.2 Remove and grub large tree stumps of girth

- Over 1m and up to and including 2m ……Unit: No.
- Over 2m and up to and including 3m ……Unit: No.

The girth of a tree or stump will be measured at the narrowest point of the tree or stump in the first meter of its height above ground level. Trees and stumps of girth exceeding 1m will be measured individually and classified according to site in increments of 1m as indicated above.

The rate shall cover the cost of clearing and grubbing trees and stumps of all sizes, cutting branches, backfilling holes, and removing, transporting, and disposing of all such trees, stumps, and branches and associated material.

PS 8.2.3 Remove and grub all trees and tree stumps regardless of girth…… Unit: No

In exceptional circumstances, where construction is carried out through plantations or where the quantity of trees or girth exceeding 1m renders individual measurement impracticable the Project Specification may provide that clearing and grubbing of trees be measured in hectares. If this method of measurement is used the areas to which it is applicable will be defined clearly on the drawings and the reason for adopting the method of measurement will be stated in the project specification.

The rate shall cover the cost of all operations specified in 8.2.2.

PS C 8.2.5 Take down existing fence

The rate shall cover the cost of taking down the fences, coiling wire and stacking all material at sites indicated by the Engineer and the cost of loading, transporting and offloading such material.

SABS 1200 PSDB: EARTHWORKS (Pipe trenches)

PS DB 1 SCOPE

This specification covers earthworks for trenches for all types and sizes. It covers excavation, the preparation of a trench bottom, backfilling and the reinstatement of surfaces.

PS DB 3 MATERIALS

PS DB 3.1 CLASSIFICATION FOR EXCAVATION PURPOSES

PS DB 3.1.1 Method of Classifying

Substitute DB 3.1.1 and D.B.3.1.2 (a), (b) and (c) with the following:

The Engineer shall classify excavated materials as Soft Class and Rock will be measured individually as extra-over items.

TABLE 1: CLASSIFICATION OF MATERIALS

CLASSIFICATION	DESCRIPTION
Soft	All material other than rock
Rock	Material which cannot be economically fragmented and loosened for removal by hand implements and pneumatic tools, except by drilling and blasting or the use of rock breaking equipment.

In the first instance, the classification shall be based on the descriptions given in Table 1. In the event of disagreement between the Contractor and the Engineer, the Engineer shall reclassify the material in accordance with the relevant specifications and without being unreasonable to the Contractor. The decision of the Engineer on the classification shall then, subject to the provisions of the contract, be final and binding.

The Contractor shall notify the Engineer of the presence of what he considers to be rock immediately upon discovery thereof. The Engineer will inspect the material and decide whether or not it warrants the use of pneumatic tools or rock breaking equipment. In the case of isolated boulders set in a soil matrix, the Engineer may order the Contractor to either widen the excavation or roll the boulders sideways or lift the boulders out of the trenches.

In the event that the Engineer decides that the use of pneumatic tools, rock breaking equipment, or blasting is necessary, he will classify the material accordingly and arrange for the quantity thereof to be measured. The Construction Manager will supply necessary pneumatic equipment and arrange for others to break up rock into manageable pieces.

PS DB 3.5 BACKFILL MATERIALS

- Substitute “from trenches” in DB 3.5(a) with “from trenches and street excavations”.

Add the following to DB 3.5 (b)

- Road crossings, access to services, farms and camps and any section that fall within the road reserve shall be classified as areas subject to loads from road traffic and must be compacted accordingly to the top of the trench (natural ground level).

PS DB 3.7 SELECTION OF MATERIAL FOR REPAIR WORK

If the excavation of a pipeline damages an existing road surface, the Contractor must stockpile material from the top 200mm of such a road surface in order to reuse it as subbase for the repairing of the road crossing.

If necessary, gravel material that is suitable for the reparation of road surfaces must be imported.

The Contractor must make provision in his tariffs for compaction in road reserves for the selection of excavation material as specified above.

PS DB 4 PLANT

PS DB 4.1 EXCAVATION EQUIPMENT

Add the following to DB 4.1

An adequate number of suitable tools, including hand stampers, wheelbarrows and hosepipes shall be provided by the Contractor. The Contractor will supply mechanical compaction equipment and when required pneumatic and rock breaking equipment.

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

PS DB 5 CONSTRUCTION

PS DB 5.1 PRECAUTIONS

PS DB 5.1.1.1 Water in Trenches

Water in pipe trenches may cause movement of the pipes as a result of floatation and backfilling must therefore be executed as quickly as possible. If movement of the pipes does occur the contractor must, unless otherwise instructed by the Engineer, remove pipes from the trench and reinstall it at his own expense.

PS DB 5.4 EXCAVATION

Add the following to DB 5.4:

"Excavation and backfilling of pipe trenches on sidewalks in the residential area shall be done in such a manner as to ensure the least possible disruption to the public and access to the properties. No additional payment shall be made for this and all relevant costs shall be deemed to be included in the tendered rates."

PS 5.5 TRENCH BOTTOM

Substitute "90%" in the second paragraph of DB 5.5 with "93%".

PS DB 5.5.1 Over Excavation of Trenches

Where pipe trenches are excavated deeper than specified or shown on the drawings, these excavations must be backfilled with suitable approved material in layers of not more than 150mm uncompacted thickness and must be compacted to the thickness of the adjoining in-situ material or as prescribed by the Engineer.

PS DB 5.6 BACKFILLING

PS DB 5.6.1 General

Backfilling in road reserves must be compacted in 100mm layers up to natural ground level.
Where prescribed by the Engineer all surplus material must be neatly piled over the real trench width to a height not more than 150mm high than the adjoining level.

PS DB 5.6.3 Disposal of Soft Excavation Material

Add the following to DB 5.6.3:

All surplus and unsuitable material as described in DB 5.6.3 shall be disposed of at the spoil site, (as described in PS D 5.2.2.3) and levelled.

PS DB 5.7 COMPACTION

PS DB 5.7.2 Areas Subject to Traffic Loads

Add the following to DB 5.7.2:

All pipe trenches within road crossings, accesses to services, farms and camps that fall within the road reserve, will be regarded as areas subject to traffic loads. Backfilling of trenches that are subject to traffic loads will be executed in layers of 100mm as follows:

Item	% mod AASHTO	Final Layer Thickness
Approved Backfill	93%	200mm
Main Backfill up to road layers	96%	200mm
Sub-base	97%	200mm
Base	98%	175mm

PS DB 5.9 REINSTATEMENT OF SURFACE

PS DB 5.9.2 Private Property and Commonage

Add the following to DB 5.9.2:

Gardens and lawns shall be repaired to the original standard where they were crossed. Grass and plants shall be taken out of the ground, temporarily stocked, watered during construction and replanted after backfilling.

PS DB 8 MEASUREMENT AND PAYMENT

PS DB 8.2 COMPUTATION OF QUANTITIES

PS DB 8.2.4 Shoring

Add the following to DB 8.2.4:

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

PS DB 8.3.2 Excavation

- Excavation in all material for trenches, backfill, compact, and dispose of surplus material …… Unit: (m)

Item will be provided for various pipe diameters in steps not greater than those specified in 5.2. and various depths in increments of 1.0m measured to the bottom of the bedding layer (see Drawing DB 2, DB 3 and DB 4). Where measured volumetrically in terms of 8.1.2 (a), the volume of excavation will be computed in accordance with 8.2.2 and 8.2.3.

The rate shall cover the cost of the same operation in heading where the Contractor elects to use such a method of excavation. The volume or length will be measured for payment on the assumption that normal trench excavation has been carried out. The volume or length in the undisturbed prism of material between the top of the tunnel and ground level will be classified as soft excavation in terms of 3.1. No additional payment will be made for such headings and no deductions will be made for reduced excavation quantities.

- **Extra-over item (a) above for:**

- Intermediate excavation ……Unit: m^3
- Hard rock excavation …… Unit: m^3
- Excavation in Boulders Class A…… Unit: m^3
- Excavation in Boulders Class B…… Unit: m^3

Separate items will not be provided for depth increment, volume will be computed from the trench width determined in accordance with 8.2.3 and the depth from the top of the intermediate or hard rock excavation, as the case may be, either to the bottom of the same material or to the bottom of the trench as specified in (a) above, whichever is the lesser (see Drawing DB 5).

The rates shall cover the additional cost of the excavation and hauling of the more difficult material of unsuitable material.

- Excavate and dispose of unsuitable material from trench bottom (provisional) ……Unit: m^3

The volume will be computed from the trench width determined in accordance with 8.2.3 and m^3 the additional depth ordered.

The rate shall cover the cost of the excavation of the additional depth in any material, the disposal of the unsuitable material as specified for soft excavation in 5.6.3 within free haul distance and the backfilling of the additional depth with suitable material from the site of the trench.

PS DB 8.3.3 EXCAVATION ANCILLARIES

PS DB 8.3.3.1 Make up deficiency in backfill material

- From other necessary excavations on site ……Unit: m^3
- By importation from designated borrow-pits …… Unit: m^3
- By importation from commercial or off-site sources selected by the Contractor ……..Unit: m^3

Items (b) and (c) above will not be measured for payment unless importation has been ordered in writing. The volume will be computed from the trench width determined in accordance with 8.2.3 and the depth from the top of the backfill to the top of the bedding as shown on Drawing DB-1 or the actual depth of the backfill used to make up the deficiency or the depth of additional excavation in terms of B3.2(c), as applicable.

The rate for material from other necessary excavations on site shall cover the cost of selection of suitable material, the moving of the material to points alongside the trench spaced to suit the contractor's method of working, and the disposal of the material that is replaced, all within free haul distance.

The rate of material from commercial or off-site sources selected by the Contractor shall cover the cost of the acquisition of the material (including royalties, if applicable), the moving of the material to points alongside the trench spaced to suit the Contractor's methods of working, and the disposal of the material that becomes surplus as a result of the importation, all within free-haul distance (see Sub-clause 5.2.5.1 of SABS 1200 D or Sub-clause 5.2.6.1 of SABS 1200 DA, as applicable).

PS DB 8.3.3.2 Opening up and closing down of designated borrow pit …… Unit: Sum

This item will only be scheduled when a new borrow-pit has been established or when access to any existing borrow-pit has to be established.

With the exception of the cost of the removal and spreading back of the topsoil (if scheduled), the sum shall cover the cost of opening up and of restoring the Site as specified in Schedule 5.2.2.2 of SABS 1200 D or Subclause 5.2.2 (f) of SABS 1200 DA, as applicable.

PS DB 8.3.5 Existing Services

Existing services – that intersect or adjoin a Pipe Trench (see Sub-clauses 5.1.2 and 8.3.8 of SABS 1200 D or Sub-clauses 5.1.3 and 8.3.5 of SABS 1200 DA, as applicable).

- Services that intersect a trench (angles between centerlines in plan of 45-90^o) … Unit (No)

Except where water pipes are to be recovered, existing water pipes, sewers, stormwater pipes, concrete-lined channels and drains, box culverts, electric cables, ducts, kerbs, channels, erf connections and

various sizes of pipes and services that intersect a trench of specified width and require various degrees of care, whether or not their presence is known before they are uncovered, will be measured separately. The unit refers to one service, but services that are so grouped that they can be contained within a horizontal dimension of 200mm measured at right angles to the axis of the services will be measured as one unit.

- Services that adjoin a trench (parallel to or at an angle between center-lines in a plan of less than 45^{o}) …… Unit: No.

In case where a trench of specified width

Runs parallel to or at an angle (in plan) of less than 45^{o} to an existing service, and is such that the nearer side of the bottom of the trench lies at least partly between the vertical plane and a plane that lies at an angle of 45^{o} below the horizontal, both planes passing through the axis of the service, the length of the service within the minimum base width of the trench, determined in accordance with 5.2, will be measured for payment under this item and the remaining length, the side of the trench which, in the opinion of the Engineer, is rendered liable to collapse because of the existence of such service, will be measured for shoring (see 8.3.4 (a)). The rate for an item scheduled in terms of (a) and (b) above shall cover the additional cost of

1. Care in excavation necessitated by the presence of such service in or across the trench
2. Protection and maintaining such service in operation by means of temporary supports or shoring, as necessary.
3. Repairs necessitated by damage caused by the Contract.

PS DB 8.3.6 Finishing

PS DB 8.3.6.1 Reinstate Road surfaces complete with all courses Unit: m2

Replace D.B 8.3.6.1 with the following:

- Gravel - Unit: m^2

The area will be calculated from the length of finished road and paved surfaces as applicable and with the trench width taken as 0.8m. Payment for finishing will be additional to that for excavation covered by 8.3.2.

The rate shall cover the cost, selective excavation (including the equipment that is required to break up, removed and, if necessary, stockpile the original surface material), and subsequently of reinstating and compaction and shall include the cost of delays and the cost of any risk of having to repair damage as specified in DB 5.10. Compaction to be according to PS DB 5.7.2.

1200 PS LB: BEDDING (PIPES)

PSLB 1 SCOPE

This specification covers the bedding (bedding cradle and selected fill blanket) for buried pipes carrying fluids under pressure or gravity. It covers the basic materials, the quality, manufacture, tolerances in workmanship, testing and the methods by which the finished structure is to be measured for the purposes of the payment.

PSLB 3 MATERIAL

PSLB 3. 1 Selected granular material

Selected Granular Materials (sub clause 3.1)
Delete the word "singularly"

PSLB 3. 3 Bedding

Add the following to LB 3.3:

All pipes shall be classified as flexible pipes and shall be laid on a Class C bedding except at stream and road crossings, which shall be classified as rigid pipes.

PSLB 3. 4 Selection

Suitable selected bedding material will occasionally be available from trench excavations along the route.

PSLB 5 CONSTRUCTION

PSLB 5. 1 Trench

PSLB 5. 1. 4 Compacting

Substitute "90 % of mod AASHTO" in LB 5.1.4 with "93 % of mod AASHTO (100 % for sand)". The use of mechanical compaction equipment will not be permitted within 300mm above the crown of the pipe

PSLB 6 TOLERANCES

PSLB 6. 1 Moisture Content and Density

The degree of accuracy shall be II.

PS LB 8 MEASUREMENT AND PAYMENT

PS LB 8.2 Scheduled Items

PS LB 8.2.2.4 From stockpile (provisional)

a) Selected granular material ..... Unit: m^3

b) Selected fill material ..... Unit: m^3

The rate shall cover the cost of obtaining, handling and transport regardless the distance, of the required bedding material from the stockpile, the delivery thereof at positions that are spaced along the trench in such a way as suits the working method of the Contractor, as well as the removal of material displaced by this importation within the free-haul distance.

PROJECT SPECIFICATION: PORTION 2

SABS 1200 PSGA: CONCRETE (SMALL WORKS)

PSG1 SCOPE

This specification covers the requirements for concrete (plain and reinforced) for small works associated with pipelines, roads, railways, pump stations, etc. It covers the basic materials, the plant formwork required, the quality, manufacture, arid curing of concrete, tolerances in workmanship, testing and the methods by which the finished structure is to be measured for the purposes of the payment.

PSGA 3 MATERIAL

PSGA 3.2.1 Applicable Specifications

Portland cement that conforms to SABS 471

Strength Concrete

- The contractor shall submit concrete design mixes for the various classes of concrete specified on the drawings and in the Tender document.
- The Contractor's attention is drawn to the fact that concrete for water retaining structures is to have a free water/cement ratio of less than 0.53 and a cement content of not less than 360 kg/m^3 but not more than 400 kg/m^3
- If the required water/cement ratio causes the need for more cement for a specified concrete strength, it will be measured and pay for accordingly.
- It is required that the Contractor employs the services of a specialist to obtain design mixes compatible with the specification.
- No concrete shall be placed until the Contractor's concrete mix design has been approved by the representative of the client. The contractor shall submit the design mix, including a report from an approved testing laboratory, indicating the 28 day concrete strength obtained when using the materials proposed for the work.
- The determination of strength shall be based on not less than three concrete test specimens.
- The preparation of the 150mm test cube specimens and the sampling techniques shall be in accordance with the relevant SABS specification.

PSGA 3.2.2. Storage of Cement

Add the following to G 3.2.2:

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

PSGA 3.2.3. Cement

All cement used shall conform to SANS 50197-1 (common cements). CEM I, Portland cement, is preferred

CEM II & CEM III cement with the specified composite for water retaining structures can be used with recommendation from a specialist cement testing laboratory adhering to the CCI guidelines

The composition and strength class of the cement (to SANS 50197-1) shall be clearly indicated on all cement packaging from the cement supplier.

Portland Cement Extenders shall comply with the following SANS standards:

Ground granulated blast- furnace slag	– SANS 1491: Part 1
Fly ash	– SANS 1491: Part 2
Silica fume	– SANS 1491: Part 1

If during construction there is any change in the cement used as originally used in the design mix, a new design must be submitted and record must be kept of the structure(s) on site that was constructed with a specific design mix.

The tenderer is advised to refer to the **CCI - Guideline** for selecting cements for concrete - as in their publication “Cementitious materials for concrete standards, selection & properties”.

PSAGA 3.2.4 Aggregates

Where aggregates are tested in accordance with clause 6.11 of SABS 1083, the shrinkage of concrete test cubes made from the proposed aggregates will not exceed the following:-

0.045% when used in reinforced concrete for water retaining structures.

0.055% when used for other reinforced concrete.

0.075% when used for mass concrete.

When uncertainty about the shrinkage characteristics of an aggregate exists, the Contractor will submit a certificate from an approved laboratory, in which the shrinkage characteristics are stated

PSAGA 3.2.5 Joint Filler

- Pre-formed joint filler must consist of pre-fabricated plates or strips with thickness as shown on the drawings with a tolerance less than 1.5 mm. The material to be used must be compatible with the joint seal material used with it. Subject to the above limitation, joint filler may consist of bitumen-impregnated fiberboard, closed-cell polyethylene or similar material which will be separated from the joint seal material by means of a suitable approved bond breaker compatible to the joint seal material.
- Joint fillers must comply completely with the requirements in terms of compression, recovery after compression, processing, etc. as contained in "The Ministry of Public Buildings and Works" General specification No 201, Clause 606, "US Federal Specifications" HH-F-341 A (Type I Class B) and ASTM Specification D 1752-60T (Type II).

PSAGA 3.2.6 Joint Seal Material

- Joint seal material must comply with the requirements of BS 2499 for hot-cast joint seal material and "US Federal Specification" TTS - 00230 or TT - 00227 E or SABS 110: 1973 for cold-applied joint seal material.
- Other joint material may be used when approved by the Representative of the client after submission of the complete specifications and information to the Representative of the client by the Contractor.
- Joint shall be prepared and sealant mixed and applied in accordance with the manufacturer's current data sheets

PSAGA 3.2.7 Waterstops

- Waterstops shall be made of natural rubber or PVC, the type as indicated on the drawings
- The waterstops must be accurately formed, free of air bubbles and other defects, and must be supplied in such lengths as to minimize the jointing on site.
- When jointing the water stops the standard intersection pieces must be used where required. At the intersections, and when an insufficient length has been provided, jointing may only be done as prescribed by the supplier. This will be done using heat weld equipment as well as jigs for an accurate and square joint. The joint will be tested by flexing (not folding) the waterstops several times. The joint should stay intact.
- In the event of jointing not being performed to the Representative of the client's satisfaction the Representative of the client may, at his sole discretion, instruct the Contractor to employ a specialist contractor to join the waterstops all at the cost of the Contractor.

PSAGA 3.2.8 Rubber Waterstops

- Natural rubber waterstops must contain at least 70% natural rubber, and must have the following characteristics:

a) Hardness grade : (B.S.S 903 / Part A7 1957): 60-65 IRH

b) Tensile strength : 21 MPa at 25°C

c) Lengthening at break point : 500% at 25°C

d) Density : 1100 kg/m^3

- Joints between rubber waterstops must be vulcanized according to a heat-process; pressure, temperature and time being strictly controlled. Vulcanizing must be done with the prescribed equipment, strictly according to the manufacturer's specifications.

PSAGA 3.2.9 PVC Waterstops

- PVC waterstops must have the following characteristics:

Density	:	1300 kg/m^3 (min)
Tensile strength	:	14 MPa at 25ºC
Lengthening at break point	:	300% (min) at 25ºC
BS Hardness grade	:	42 - 52 at 25ºC
Water absorption	:	Submerged in water, 48 hours at 50°C: 0.6%

- Joints between PVC waterstops must be made on site according to the hot-weld process

PSAGA 3.2.10 Epoxy Resin

- Epoxy resin must be of approved make and must be suitable for use with structures and repair work. It must be used strictly according to manufacturer's directions.

PSAGA 3.2.11 Construction

This section covers the construction of all permanent joints in concrete structures.

All instructions from manufacture or/and suppliers of material must be carried out carefully. These instructions, together with written guarantees must be obtained by the Contractor and handed to the Representative of the client for approval before any material may be ordered

PSAGA 3.2.12 Open Joints

- Open joints must be formed with wood, metal or other approved material. When the concrete has hardened, the material used to form the joint must be removed, except where the drawings show it to be a permanent part of the joint.

PSAGA 3.2.13 Filled Joints

- Filled joints must be filled with joint filler complying with the specifications or as shown on the Drawings
- After the concrete has hardened the top strip must be removed and the thus formed groove must be cleaned, a primer applied, and filled with the joint filler. No sealing may be done within 21 days after the placing of the concrete. Joints must be filled under supervision of a representative of the joint seal material manufacturer.
- Joints to be sealed with bituminous mixtures must be formed according the dimensions shown on the Drawings. The cavities must have rough sides. Shuttering must, where possible, be left in the joints till just before the filling of the joints. After the shuttering is removed, the joint must be cleaned with wire brushes and compressed air.
- Joint shuttering must be un-planed and may not be treated with oil or other substances as this may affect the adhesive characteristics of the bitumen mixture.
- All harmful material, which may affect the adhesive characteristics of the bitumen mixture against the concrete, must be removed by sandblasting on the Contractor's account
- A chamfer of 12 x 12 mm must be formed on both sides of all expansion joint between floor slabs, wall panels etc. except where otherwise shown on the drawings or requested by the Representative of the client.

PSAGA 3.2.14 Waterstops Installation

- Where shown on the drawings, rubber or PVC waterstops must be installed to make the joint watertight. The Contractor must supply the Representative of the client with samples of the proposed material for approval before using any of the material in joints.
- All waterstops must be supplied with anchor-rings to keep them in position while placing the concrete.
- No opening in the split shuttering, both sides of the waterstops, through which fine cement, etc. may leak, will be allowed, because this may lead to sponginess in the concrete in a very vulnerable position.
- Special care must be taken when concrete is cast and compacted around the waterstops to ensure that the strips do not move, deform or get damaged.
- Where a horizontal waterstops is installed, the concrete must be forced underneath the strip by hand after which the top surface of the strip is tamped in order to compact the concrete underneath. The surplus concrete can then be removed until the strip lies in a horizontal position.
- Where waterstops are fabricated in the form of a network at the factory, every network must be checked before placing. Networks must be marked at the factory for easy identification on site.
- Waterstops must be checked for damage, joint damage and suitability by both the Contractor and the Representative of the client before the strips are built into the concrete
- The installation and building in of waterstops must be done under the constant supervision of an artisan approved by the Representative of the client.

PSAGA 3.2.15 Ferrule Holes

- Holes formed in reinforced concrete walls during the fixing of formwork shall be repaired on the waterside face with an approved epoxy or no-shrink grout
- On the dry face the holes in the concrete shall be repaired with a 1:3 cement-sand mortar
- All grouting material shall be thoroughly panned in.

PSAGA 3.2.16 Pipes and Conduits Embedded in Concrete

- Except with the written approval of the Representative of the client, no pipes other than shown on the drawings shall be embedded in concrete, and the approval of the Representative of the client for the position of all services to be embedded shall be obtained before concreting commences. The clear space between such pipes and reinforcement shall not at any point be less than:

a) 40mm or
b) 5mm plus the maximum of coarse aggregate, whichever is the greater.

PSAGA 3.2.17 Grouting of Pipes/Specials through Water Retaining Walls

- Where entry holes for pipes/specials have been provided in the water retaining walls, the Contractor shall be responsible for the grouting-in of such pipe/specials, regardless of where or not these have been supplied by himself
- Before commencing the positioning in holes of any pipes/specials the Contractor shall:

a) Remove all shuttering and boxing remaining in the holes.
b) Make any alterations required to the position and shape of the holes;
c) Thoroughly clean the sides of the holes so as to obtain a satisfactory bond surface for the new concrete.

- After accurately positioning the pipes/specials in their respective holes, the Contractor shall fix the pipes/specials in the holes.
- Immediately before grouting is 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, a mortar consisting of 3 parts of concrete sand and 1 part of cement.

- The concrete ingredients shall be mixed and placed as dry as possible to obtain a dense, water proof concrete. Where a watertight seal is required, 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 any falling away from pipe/specials surface of the concrete already placed. The whole shall, when set, form a dense, homogenous, and waterproof mass. A spare vibrator with an independent power source shall be kept in readiness to ensure continuity of placing in the event of the breakdown of the duty vibrator.
- Smooth formwork that has been suitable strengthened for use with a vibrator shall be provided for casting the concrete around each pipe/special.

PSAGA 3.2.18 Frequency of Sampling

- The Contractor shall make a set of three cubes for every 5 cubic meters of concrete poured but no two cubes shall be from the contents of any one concrete batch mix.

PSGA 4. PLANT

PSGA4.4 Formwork

PSGA 4.3.3 Ties

Add the following to G 4.4.3:

No ties will be allowed in vertical walls and permanent metal ties shall have a minimum concrete cover of 40mm. Tie holes shall be filled with an approved non-shrink epoxy grout.

PSAGA 5 CONSTRUCTION

PSGA 5.1 REINFORCEMENT

PSGA 5.1.3 Cover

Substitute G 5.1.3 with the following:

The cover of concrete over reinforcement, unless otherwise indicated on the drawings, shall be not less than 40mm.
The total reinforcement mass is expressed in ton and includes all diameters. Mass is not expressed as per equivalent 25mm bars. Payment will be made per ton of all diameters and no additional payment will be made for smaller diameter bars.

PSGA 5.2 FORMWORK

PSGA 5.2.1 Classification of 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 SABS 1200G.
- After the concrete has hardened sufficiently, it shall be floated to a uniform surface free of trowel marks.

Steel-Floated Finish

Where steel floating is specified or scheduled, the surface shall be treated as specified in sub-clause 5.5.10.1 except that, when the moisture film has disappeared and the concrete has hardened to prevent laitance from being worked to the surface, the screeded surface shall be steel troweled firm pressure to produce a dense, smooth, uniform surface free from towel marks.

Power-Floated Finish

- Where power floating is specified or scheduled, the surface shall be treated as specified in sub-clause 5.5.10.1 except that the screeded surface shall be power-floated to produce a high quality dense, smooth, uniform surface free from trowel marks.

PSGA 5.4 CONCRETE

PSGA 5.4.1 Quality

PSGA 5.4.1.2 Consistency

Add the following to sub clause G 5.4.1.2:

The slump of concrete used in water retaining structures may not be less than 30mm and not more than 60mm.

PSGA 5.4.1.5 Strength of Concrete

Add the following to G 5.4.1.5:

The grade of strength of concrete and the maximum normal size of coarse aggregate for each portion of the works, unless otherwise indicated on the drawings, shall be as follows:

- Blinding layers and encasing of pipes 20 MPa/19mm
- Benching 20 MPa/19mm
- Screeds 20 MPa/10mm
- Reinforced concrete 35 MPa/19mm

PSGA 5.4.1.7 Durability

Concrete shall be so proportioned to ensure that the water/cement ratio does not exceed 0,5 and, to ensure workability, water-reducing admixtures of approved manufacture shall be used in preference to increase the cement content.

PSGA 5.4.8 Concrete Surfaces

Add the following to GA 5.4.8.1:

Concrete surfaces under screeds, granolithic finishes or benching shall be brought up to a plane, uniform surface with a suitable screed board.

PSGA 5.4.11 Construction Joints

The use of construction joints must be minimized and may only be placed as shown on the drawings or at positions as approved by the Engineer.

At all construction joints in walls a HDPE water stop without a centre bulb must be placed as shown on the drawings.

Alternative materials with similar properties may be proposed but may only be installed after approval of the Engineer.

PSGA 5.4.12 Wood-floated finish

Where wood-floating is specified or scheduled, the surface shall first be given a finish as specified in G 5.5.10.1 and after the concrete has hardened sufficiently, it shall be floated to a uniform surface free from trowel marks. The screed surface shall be wood-floated, either by machine or hand, only sufficiently to produce a surface free from screed marks.

PSGA 5.5.4.13 Steel-floated finish

Where steel floating is specified or scheduled, the surface shall be treated as specified in PS G 5.5.10.4 except that, when the moisture film has disappeared and the concrete has hardened sufficiently to prevent laitance from being worked to the surface, the screed surface shall be steel-trowelled under the firm pressure to produce a dense, smooth, uniform surface free from trowel marks.

PSGA 8 Measurement and Payment

PSGA 8.1.1 Formwork

Formwork, other than formwork covered by 8.1.1.2 and 8.1.4, will be measured as the net area of the face of the concrete to be supported during the disposition of concrete. No deduction will be made for fillets and splays of size up to 50mm x 50mm or for openings of diameter up to 0,7 m or of area up to 0,5 m^2.

Formwork in continuous lengths of narrow widths and of filters or splays over 20 mm x 20 mm will be measured by length, the width or range of widths being stated in the schedule. Boxing-out, the forming of holes, and other such operations will be measured by number, basic dimensions, perimeters, or drawing references, as stated in the schedule.

The unit rate shall cover the cost of all parts of formwork in contact with the concrete, and the necessary bearers, struts, and other supports, plush the labour and plant necessary to erect and stick such formwork.

PSGA 8.1.2 Reinforcement

Steel for normal reinforced concrete will be measured net by mass of all bars, including supporting steel detailed on the reinforcing schedules. The mass will be computed from the nominal bar size and nominal mass per unit length. No allowance will be made for cutting, waste, spacer devices (material other than steel bars), or binding wire.

Steel reinforcement for precast concrete units will not be measured unless so scheduled (see 8.6).

Welded mesh will be measured by area as shown on the drawings, no allowance being made for cutting, waste, laps or deductions for end cover. The areas measured will be those of the concrete floor or slab being reinforced by means of mesh. In the case of continuous unit partly reinforced by mesh, the area will be computed from the outside dimensions of the area covered by mesh regardless of whether or not additional reinforcing shall is present in the same area.

Steel off cuts resulting from the cutting and bending of reinforcement in accordance with the bending schedules shall be deemed to be the property of the Contractor.

PSGA 8.1.3 Concrete

- Concrete will be measured net to the dimensions shown on the drawings or to the dimensions cast, whichever are the smaller. Structural elements that are undersized will be measured for payment only if they are accepted by the Engineer.
- No allowance will be made for concrete required to make up overbreak in soft excavation, but payment will be made for additional concrete or formwork, or both, ordered in writing by the Engineer to replace unsuitable material or overbreak in hard rock or in intermediate excavation (see (d) below).

The unit rates shall cover the cost of the provision of concrete (made with ordinary Portland cement unless otherwise scheduled), mixing, testing, placing, compacting, the forming of stop-ends and unforeseen construction joints, striking of for levelling as applicable, and curing and repairing where necessary, together with the cost of all parts of formwork in contact with the concrete aid the necessary bearers, struts, and other supports, plush layout and plant necessary to erect and strike such formwork.

PROJECT SPECIFICATION: PORTION 2

PSG CONCRETE (STRUCTURAL) (SANS 1200 G)

PSG2 Interpretations

PSG2.4.2 Strength concrete

Unless otherwise specified on the drawings or in the Schedule of Quantities, all structural concrete shall be Grade 35MPa/19mm.

PSG2.4.3 Joints

Notwithstanding Subclause 2.4.3, "designated joints" will only be joints that are shown on the drawings. Any other joints that are required by the Contractor as a result of his construction constraints or for any other reason, whether approved by the Engineer or not, will not be considered to be designated joints as defined in Subclause 2.4.3, i.e. they will be considered to be "non-designated" joints.

PSG3 Materials

PSG3.2.1 Cement

Replace G 3.2.1 with the following:

All concrete mix designs shall be approved by the Engineer in advance. Strength of concrete is as shown on the drawings.

The mix design and casting procedure shall be approved by the Engineer prior to casting.

Portland Cement I5FA (“PC I5FA”) compliant with the requirements of SANS 831 can be used. The fly-ash cement obtained by blending of the OPC and Pulverised Fly Ash (PFA) shall comply with the requirements of SANS 1466-1988. No other types of cement (e.g. Rapid Hardening Cement, Portland Blast furnace Cement) may be used. If aggregates to be used in this contract are alkali-reactive, the OPC used on this Contract shall not have an alkali content $Na_2O+0,656K_2O$) which exceeds 0.6% by mass of the cement. For the cement used in conjunction with the selected additional aggregates the alkali content per cubic metre of concrete shall not exceed 2,1kg. The Contractor shall submit the necessary test results to prove the above.

Add the following to G 3.2.1:

“In accordance with the new SANS, all Portland cement (OPC or RH) shall be in accordance with SANSENV 197-1 (CEM II) except for non-structural concrete where CEM I 32.5 is acceptable. Pulverized fly ash (PFA) shall conform to the requirements of SANS1491-2.”

PSG3.2.2 Alternative types of Cement

Replace the contents of G 3.2.2 with the following:

“Only ordinary Portland cement (OPC) may be used. Should the Contractor wish to use any other type of cement, he shall obtain the Engineer's prior written approval (see G 8.1.3.2 and 8.1.3.3).”

PSG3.2.3 Storage

Cement shall be used in the order in which it is received.

Unless approved by the Engineer, cement kept in storage for longer than 10 weeks shall not be used in the Works.

Any cement that contains lumps that cannot easily be crumbled to powder between the fingers, may not be used.

PSG3.3 Water

Only potable quality water from an approved source may be used for mixing concrete. Water from a river or stream may however be used for curing.

PSG3.4.1 Aggregates

The maximum aggregate size shall be as shown on the drawings.

Aggregates may be obtained from local sources subject to testing of its suitability by an approved laboratory and approval by the Engineer.

The maximum water absorption of the coarse aggregate shall not exceed 1% and the flakiness index shall not exceed 25%. The maximum water demand of the fine aggregate shall be 190 l/m^3 and the aggregate shall comply with the requirements of SANS1083.

Aggregates to be used in this contract shall be tested in accordance with subsection C-15 of SANS 1083 to determine whether they are potentially alkali-reactive. If they are alkali-reactive they shall either be replaced with aggregates that are non-reactive. The fineness modulus of the sand must be between 1,7 and 2,8 with a standard deviation of not more than 0,1. 19 mm aggregate size (maximum 20 mm to be used).

At tender stage the Contractor shall assure himself by means of tests and test mixes by an accredited laboratory that the fine and coarse aggregates that he intends to use comply with the specification. The tendered rates shall therefore be deemed to allow for the importation of aggregates that do comply with the Specification.

The Contractor shall be responsible for locating the sources of all aggregates."

Aggregates shall be tested periodically for reactivity, the cost of which shall be deemed included in the rate tendered for concrete. A design mix will have to be made and the results submitted to the Engineer for approval 14days prior to casting the first concrete.

Add the following new sub-clause to G 3.4:

PS G3.4.4 Alkali-aggregate Reaction

The quartzite and shale of the Witwatersrand Supergroup contains have secondary materials such as silica and calcite believed to be responsible for moderate level of potential alkali reaction reported in reservoirs, bridges. This shall not be used in conjunction with high alkali cement in concrete in any part of the Works.

For the purposes of this clause, a high alkali cement is one in which the equivalent alkali content (Na_2O + 0.658 K_2O) exceeds 0.60 % by mass of the cement.

In order to ensure that the above requirement is met, the Contractor may elect to use an aggregate other than Witwatersrand Supergroup that complies with the requirements of SANS1083. Alternatively, if the Contractor chooses to use Witwatersrand Supergroup, he shall comply with the following requirements regarding the cement:

a) Before commencing any particular section of the structure, the Contractor shall ensure that he has enough cement that is not a high alkali cement to complete the section.
b) Certificates stating the alkali content of each delivery of cement to the Site shall be supplied by the Contractor. These certificates shall be based on tests carried out at a laboratory approved by the Engineer. The cost of testing, including sampling, transporting of samples, and issuing of certificates, shall be borne by the Contractor.
c) The Contractor shall be entitled to use an approved brand of cement as a means for ensuring that the permissible alkali content is not exceeded. The Contractor shall make allowance for the higher price of such approved brand, if he chooses to use this method.
d) High alkali cement delivered to the Site shall be rejected, and the cost of its removal and replacement with cement with acceptable alkali content shall be borne by the Contractor."

PSG3.4.5 Samples

At least one month before commencement of concrete work the Contractor shall supply at his own cost representative samples to the Engineer of the aggregates he intends using, together with certificates from an approved laboratory indicating that the aggregates comply with the specifications. Approximately 50 kg of each sample of aggregate shall be supplied.

PSG3.5 Admixtures

The use of admixtures will be subject to the approval of the Engineer. The information listed in Subclause 3.5.1 shall be provided.

In addition all water retaining structures will include admixture as specified.

Add the following new sub-clause to G 3:

PSG3.9 Materials for movement joints

PSG3.9.1 General

The various jointing materials, the manufacturers of the materials and the methods of application shall be as approved by the Engineer. Materials shall be stored and protected to avoid damage, degradation, distortion or contamination.

The joint materials shall be resistant to ultraviolet light and to biological degradation.

PSG3.9.2 Water stops

Waterstops shall be of approved manufacture and of the pattern and the material and widths scheduled and specified and shown on the drawings. They shall comply with the tolerances specified in Subclause 6.1. They shall conform to Specifications CKS 388 or 389, for natural rubber or PVC respectively.

All intersections between water stops shall be prepared by mitring and welding/vulcanising intersection pieces in the factory in accordance with the manufacturer's instructions and to approval of the Engineer. Only straight lengths of water stop may be field welded using the appropriate jigs and tools.

Where required, water stops shall have eyelets so that they may be tied securely to the adjacent reinforcement. "Rear-guard"-type water stops shall have flanges or cleats that grip effectively.

PSG3.9.3 Fillers

Closed cell expanded polyethylene fillers shall be pre-cut to suit the application with a tear-out strip for forming the specified recess for the sealant. If so required, the filler shall be glued into position with an approved epoxy glue.

PSG3.9.4 Bond breakers, primers and sealants

The bond breaker (if specified) shall be self-adhesive PVC tape (or equal, approved material) with a width the same as the joint recess into which it is to be applied.

The primer, if required for the sealant, shall be fully compatible with the sealing compound that is to be used.

The elastomeric sealant shall be either a two-component polysulphide liquid polymer base complying with the requirements of SABS 110 or a polyethylene based polyurethane "pouring grade" for horizontal or near horizontal joints or "gun grade" for vertical/overhead joints and joints steeper than 1 in 10 to the horizontal. All elastomeric sealants shall comply with BS 4254 Type A1 and shall have a movement tolerance of 25%.

PSG4 Plant

PSG4.3/4.4 Mixing plant and vibrators

Stand-by mixers and vibrators of adequate capacity and with an independent power unit shall be maintained on site for immediate use in the event of breakdown of the regular mixers or vibrators or failure of the power supply.

PSG4.5 Formwork
PSG4.5.3 Formwork ties

The use of sleeves for formwork ties through the walls of water-retaining structures will not be permitted. Ties, when cast in, shall have some form of positive anchorage to prevent any rotation when loosening formwork.

For watertight concrete structures the shutters shall be fastened using an approved imbedded fastening system. Open ferrules will not be permitted in the reservoir.

Add the following new sub-clause to G 4.5:

PSG4.5.4 Formwork: chamfers and fillets

All exposed external angles in concrete work shall have 20 mm x 20 mm chamfers unless otherwise specified or ordered, but the top edge of a slab that is to receive an applied finish shall not be chamfered.

Internal corners in concrete work need not have fillets unless such fillets have been specified on the drawings or ordered by the Engineer.

PSG4.5.5 Water-bath

A temperature-controlled water-bath with a capacity to cure two hundred cubes shall be provided on site. The water-bath shall be located under cover.

PSG5 Construction

PSG5.1 Reinforcement

PSG5.1.2 Fixing

Fixing of reinforcing bars by welding and heating of bars will not be permitted.

PSG5.1.3 Cover

In Subclause 5.1.3(a) amend the words "bar or stirrup" to read: "bar, secondary reinforcement, stirrup, tying-wire knots or wire ends".

Tying wire may not encroach on the specified minimum cover by more than a single strand thickness.

Add the following new sub-clause to G 5.1:

PSG5.1.6 Spacers

Spacers of approved design include approved plastic or other proprietary spacers, or purpose made precast mortar blocks.

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. 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. The mortar blocks shall be cured in water for at least 7 days. 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, will be rejected and shall be removed from the Site.

PSG5.2 Formwork

PSG5.2.1 Classification of finishes

Rough formwork Degree of Accuracy III may be used on the outside faces where concrete is more than 500mm below the final ground level.

PSG5.2.5 Removal of Formwork

The Contractor shall make provision for the continued support of beams and slabs while the formwork is being removed and/or for back propping of beams, slabs, etc. The propping may be required simultaneously on more than one level directly underneath one another. The requirements for continuous propping and/or back

propping shall be calculated to a theoretical model that is acceptable to the Engineer, and details shall be submitted for the Engineer's approval. Data required for such calculations, e.g. design loads and structural dimensions, will be supplied by the Engineer on request.

PSG5.2.6 Special smooth finish (Additional sub-clause)

All concrete surfaces that will be exposed above the final ground levels shall have a special smooth finish to a Degree of Accuracy I. The formwork used shall be high-grade, unblemished and regular in size. Formwork ties shall be placed in a regular pattern. The special smooth finish shall be an off-shutter finish to the concrete such that no after treatment is required other than at the positions of formwork ties.

PSG5.2.7 Construction Loads (Additional sub-clause)

The contractor shall not impose any construction loads which overstress the shaft walls, allowing for the age of the concrete at the time of loading and the design loads as shown on the drawings. Where necessary, propping shall be carried through more than one pour lift with the props placed as per approved lifting formwork by temporary works designer.

PSG5.5 Concrete

PSG5.5.1.1 General

The concrete mix design for strength concrete must be prepared in an approved laboratory and the results of actual test mixes must be submitted for approval together with 7-day and 28-day strength test results. Special attention is drawn to the fact that the concrete mix must provide a very dense and impervious concrete.

The concrete shall also be tested for water sorptivity, oxygen permeability, chloride conductivity, depth of cover and shrinkage.

No concrete shall be cast until the mix designs have been approved by the Engineer. The Engineer may call for revised mix designs at any stage during the Contract.

Any mix for use in the wall or floor of a water-retaining structure shall have a water/cement ratio not exceeding 0,5, shall contain not less than 375 kg cement per cubic metre of concrete and the proportions of the various aggregates shall be such as to produce a density of at least 2 400 kg/m^3. For concrete containing PFA the maximum cement content shall be 450 kg/m3.

In order to facilitate increasing the workability of concrete in the fresh/plastic state, to ensure watertightness without increasing the water/cement ratio, the Engineer may approve the use of an additive.

The workability of concrete shall be assessed by means of the slump test. The slump of each batch of concrete shall be taken and recorded directly before casting.

PSG5.5.1.4 Chloride content

With reference to Table 4, efflorescence will not be acceptable on any exposed concrete surface.

PSG5.1.5 Durability

The exposure conditions for concrete are classified as “Severe”.

Add the following values to table 5:

"The maximum water/cement ratio for moderate sections, general water retaining reinforced concrete, exterior portions of mass concrete, as well as for internal concrete in buildings under conditions of moderate exposure, is 0,50.

The maximum water/cement ratio for concrete slabs on the ground under very severe conditions, is 0,45."

PSG5.5 Concrete
PSG5.5.1.7 Strength concrete

Unless otherwise specified on the drawings or in the Schedule of Quantities, all structural concrete shall be Grade 35 MPa watertight concrete.

In the design of the concrete mix, special attention must be given to the fact the concrete is to be used in a water retaining structure and should therefore be a very dense mix."

PSG5.5.2 Batching

Batching of strength concrete shall be by mass. Prescribed concrete may be batched by volume.

PSG5.5.2.2 Water

"The accuracy of the measurement of water shall be within 2% of that required.

Water for curing concrete shall not contain impurities in sufficient amount to cause discolouration of the concrete or produce etching of the surface.

No water shall be added on site to ready mix concrete prior to placing to improve workability. All concrete delivered to site shall be checked for workability using the slump cone test and slump measured outside of the limit set from the design mix shall be rejected.

Water samples from the intended source of supply shall be taken for analysis before any concrete work is commenced, and at monthly intervals throughout the duration of the contract. If the samples are unacceptable the contractor shall either change a supply or take steps to improve the existing source, as approved."

PSG5.5.2.4 Additives (Additional sub-clause)

Approved additives shall be batched by equipment having a suitable mechanical/electrical interlock device which prevents under or over dosage of the mix.

PSG5.5.3.2/7.3 Ready-mixed concrete

Concrete from a central concrete production facility other than on the construction site will be permitted and, apart from test results in terms of 7.3.1, 7.3.2 and/or 7.3.3, test results obtained by such a production facility as part of its quality control system will be accepted for evaluation in terms of Subclause 7.3.4, provided they are stored and cured on site.

PSG5.5.5 Placing of concrete

Structural concrete shall not be cast directly against the side of any excavation without the use of formwork unless prior approval has been obtained in writing from the Engineer.

Concrete used in pipe trenches for encasement may be cast directly against the side of the excavation. Concrete for thrust/anchor blocks shall be cast directly against the side of the excavation.

The casting procedure shall be submitted to the Engineer for approval at least 14 days prior to the start of casting.

After vibration, the concrete shall be spaded in corners, in angles and against forms to release air bubbles which may have been trapped in these positions.

PSG5.5.5.10 Size of Cast (Additional sub-clause)

"In establishing the size of any one cast the contractor shall give due consideration to, and will be solely responsible for, defects which may arise from drying shrinkage, heat of hydration, or bleeding of the concrete, unless such defects flow from construction procedures stipulated by the Engineer to which the contractor has objected in writing".

a) Instrumentation of large concrete pours for foundation footing

"The contractor is required to model the effects on large members of temperature increases as a result of cement hydration during production and curing of concrete and use measures to prevent thermal cracking".

For all large concrete pours water tower base and cable anchorage structures, thermocouples shall be installed in the concrete in the centre of the pour and close to the outside surfaces to monitor temperatures during the hydration process. The type, installation method, fixing and location of the thermocouples shall be shown in a method statement which shall be submitted to the engineer 28 days before concreting of the element is proposed. Concrete placing shall not proceed until the approval of the engineer has been given and the suitability of the proposed equipment has been demonstrated by tests. The thermocouples shall be held in position in a robust manner to avoid damage or movement during concreting operations.

Temperatures within the concrete shall be recorded for each thermocouple at regular intervals and sufficient frequency from the time of placing until such time as the temperature difference between the centre and the edges of the pour is clearly established as a falling trend.

The temperature difference between the centre and the edges or between any two thermocouples, unless it can be shown that this difference is not critical to the integrity of the concrete, shall not exceed 22° C. The rate of monitoring can be reduced once it has been demonstrated that the above requirements can be met for all subsequent similar pours. The maximum temperature at any location within the pour shall not exceed 70° C.

Where it is shown from the monitoring that temperatures are excessive or that temperature differences are too high, adequate measures shall be undertaken to reduce these to acceptable levels. To avoid damage to the permanent works concrete being subjected to such unacceptable temperature effects, trials shall be undertaken in advance of permanent works concrete placing to ascertain temperature generation levels likely using the proposed concrete materials storage methods, water cooling, mixing, placing, heat insulation and curing methods".

b) Field Trial Mixes

Add the following

At least 35 days before the commencement of concreting, trial mixes shall be prepared under full-scale site conditions.

Trial mixes shall be made on each of 3 days; the workability shall equate to the designed target value. Six cubes from each mix shall be taken, three for test at 28 days and three for test at 7 days.

Further the trial mixes shall be made if the range (the maximum minus the minimum of the three cube results in any batch) exceeds 15% of the average of that batch, or if the range of the three batch averages exceeds 20% of the overall average of the batches.

The mixes shall be tested to determine the following properties:

- Workability
- Plastic density
- Water/cement ratio
- Bleeding
- Compressive strength at 7 and 28 days
- Hardened density
- Durability

Acceptable values for the limits of these properties shall be established during the trials, which shall be used to monitor the quality control of the mixes and set the standards of compliance.

The average 28-day compressive strength of the three cubes produced for each trial mix shall exceed specified characteristic strength by at least 8 MPa."

c) Temperature and Hydration of Concrete

Add the following

The temperature of concrete delivered to the point of placement shall be within the range 10º C to 30º 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."

PSG5.5.7 Construction joints

PSG5.5.7.1 General

The edge of joints, exposed to view in the finished structure, shall be formed with suitable beads to provide a straight edge true to line and level.

All joints, other than expansion, contraction and other movement joints, shall be treated as follows:

As soon as practical, but not before 15 hours after placing, the construction joint surface shall be prepared to receive fresh concrete. This preparation, as specified in 5.5.7.3(a) to (d), shall be such as to remove all laitance or inert material which may have formed and the specified chipping or sand blasting shall be such as to produce a roughened surface all over.

When concreting is interrupted concrete surfaces shall be protected from the sun as specified in Subclause 5.5.8(d) or by means of hessian kept damp until concreting is resumed. The Engineer is to be informed immediately when an interruption occurs in the casting of the concrete.

All constructional joints (both designated and non-designated, see PSG2-3), (i.e. all joints other than movement, contraction and expansion joints) shall be dealt with as specified in Subclause 5.5.7.3.

Unless construction joints between designated joints shown on the drawings are authorized by the Engineer in writing, concrete in the floor and wall shall be cast continuously between the designated joints shown on the drawings.

Add the following to sub-clause G 5.5.7.3:

d) Construction joints in water retaining structures:

The surface of the concrete shall be brushed with a steel wire brush or chipped with a light hammer or bush hammer or sprayed with a high pressure water jet within 24 hours of casting to remove all laitance and fine particles to a depth of at least 10mm and to expose the coarse aggregate embedded in sound concrete. Whichever method is used to expose the coarse aggregate the Contractor shall ensure that the green concrete is not damaged or disturbed during the preparation of the joint and that water stops are not damaged.

After the reinforcement for the next pour has been fixed and the formwork erected, the construction joint shall be cleaned thoroughly with a pressurised water jet. The joint shall then be wetted continuously with water for 24 hours to completely saturate the concrete immediately before new concrete is cast. Before the new concrete is cast all excess water shall be removed from the construction joint and the new concrete shall be cast directly onto the prepared surface.

PSG5.5.7.4 Formed joints (Additional sub-clause)

Each joint shall be formed as shown on the drawings, complete with shear key rebates, waffle formwork, V-feature, waterstops, "Flexcell" or equal, approved joint filler, dowel bars and their PVC tubes, etc. as indicated.

(a) Construction joints in walls

All construction joints in the water retaining walls and footing shall be cast with water stops. Water stops shall be 2mm thick HDPE strips. Payment shall be per linear meter. The rate shall include supply and casting in of the waterstop.

(b) Construction joints in roof slabs

Construction joints in the roof slab are permitted. The position of these joints shall be approved by the Engineer. Again, these joints shall be cast against a vertical shutter leaving a 10mm deep x 5mm wide recess which is sealed on both sides with “Sikaflex-11FC” one-part elastic joint sealant (or similar approved) to the Engineers approval.

The payment unit shall be for the linear metre. The tendered rate shall include the supply and casting-in of the water-stop, the sealant and the forming and preparation of concrete at the joint all inclusive.

(c) Construction joints (horizontal) in the walls

Construction joints in the walls are permitted. Allowable positions of these joints are shown on the drawings or shall be to the approval of the Engineer.

The waterproofing bandage shall be applied on both sides with “Sika Combiflex SG20” (or similar approved) to the Engineers approval. “SIKA water bars V20” or similar approved 200mm wide PVC water-stops are

required as shown on the on Drawing No. J000096-ST-CO-006. All water-stops shall be heat-weld jointed on site strictly in accordance to the manufacturer's specifications.

The payment unit shall be for the linear metre. The tendered rate shall include supply and casting-in of water-stop, the sealant and the forming and preparation of concrete at the joint all inclusive.

(d) Expansion and contraction joints

Expansion and contraction joints shall be constructed as detailed on drawings using PVC or rubber water stops. Water stops extruded from recycled material shall not be permitted.

Prior to bandaging, concrete surfaces shall be scabbled with a mechanical scabbler and water jetted with a 120 bar water jet. All joints shall be butt jointed and patched over.

The waterproofing bandage shall comprise of two elements:

(i) A 2 mm thick Hypelon strip (350 mm wide for expansion joints and 250 mm wide for contraction joints)

(ii) A 1 mm x 60 mm stainless steel strip with polythene backing bond breaker to the detail shown on the drawing.

The bandage shall be applied by coating the concrete and underside of the hype Lon bandage with an epoxy adhesive. The stainless steel strip is first positioned over the joint and the bandage with epoxy adhesive placed over the stainless steel strip. All trapped air shall be eliminated by hand rolling the bandage until the epoxy is fully cured.

Payment shall be per linear meter. The rate shall cover all costs for the supply and application of water stops and bandaging including the installation of the stainless steel strip.

Expansion and contraction joints shall be formed true to line in smooth formwork.

All surfaces shall be thoroughly cleaned of all accretions of concrete or other foreign matter by scraping or other approved means.

Particular care shall be taken to compact the concrete around water stops, edges, etc.

PSG5.5.7.5 Non-designated joints (Additional sub-clause)

Any non-designated joints shall be identical to designated joints, as shown on the drawings, which would be used in similar positions and perform the same function.

PSG5.5.7.6 Joints between footings or floors and walls or columns (Additional sub-clause)

Construction joints between foundations, footings or floors and walls, columns or piers connected to them, shall not be made flush with the supporting surface, but shall be made at a distance above the footing or floor shown as on the drawings or approved by the Engineer. The "kicker" shall be cast as an integral part of the foundation, footing or floor.

PSG5.5.7.7 Application of primers and adhesives (Additional sub-clause)

The concrete to which the primer or adhesive is to be applied shall be dry and shall be cleaned of all dust, grit, grease, surface laitance and foreign matter by compressed air and/or water, solvents, or other suitable approved means. The Contractor shall provide on Site an approved moisture meter to measure the degree of dryness of the joint. This meter shall be made available to the Engineer for testing. The joint shall be approved for the application of the primer and adhesive if the moisture content of the concrete is less than or equal to 5%. It may be necessary to dry the concrete surfaces locally by means of a gas torch or other approved manner.

PSG5.5.7.8 Installation of waterstops in joints (Additional sub-clause)

Waterstops shall be held in the formwork so as to prevent air pockets forming underneath them. Special precautions shall be taken to the approval of the Engineer, to ensure that all flexible water stops are in perfect contact with well compacted void-free concrete. The Contractor shall provide satisfactory supervision of such vital operations.

PSG5.5.7.9 Installation of joint filler in expansion joints (Additional sub-clause)

Joints in the filler shall be neatly butted so as to exclude mortar from the joint. Edges of filler strip against waterstops, concrete, formwork, projections, etc., shall also be closely fitted to exclude mortar, so that there is no resistance (other than the compression of the filler) to the expansion movement for which the joint is designed.

Joint filler shall be fixed to the first cast of concrete with an approved adhesive and as directed by the Engineer.

PSG5.5.7.10 Application of joint seals (Additional sub-clause)

Rebates shall be cleaned as required by PSG5.4.5 and shall be inspected and approved by the Engineer's Representative before filling.

Joint sealants and primers shall be applied strictly in accordance with the manufacturer's instructions. Flow and non-slumping grades shall be used for horizontal and vertical joints respectively.

Only skilled workmen, experienced in this type of work shall be employed to apply the sealant.

Immediately after the compound is applied the joint shall be protected against damage until completion of the Contract.

PSG5.5.8 Curing and protection

a) Base footing and Floor and Slab

Abovementioned structural elements shall be protected with approved plastic sheets that comply with the requirements as specified below immediately after the prescribed surface finishing has been completed. When the concrete has gained sufficient strength to prevent damage to the surface thereof, the plastic sheets shall be removed on a regular basis to allow the application of more water to the concrete to ensure that it is kept moist continuously. Plastic sheets shall be reinstalled after each wetting of the concrete. The curing period shall be at least 10 days.

b) Walls

Structural elements other than horizontal elements, such as walls. shall be thoroughly sprayed with water immediately after the removal of form work. Immediately after this the concrete shall be covered with approved plastic sheets. These shall be removed on a regular basis to allow the application of more water to the concrete to ensure that it is kept moist continuously. Plastic sheets shall be reinstalled after each wetting of the concrete. Abovementioned shall be cured by means of this method for at least 10 days.

Plastic sheets used for curing shall be waterproof and may not be torn or otherwise discontinuous. It shall be white or lightly coloured. Black or other dark coloured plastic sheets shall under no circumstances be allowed. Sheets shall be held down or fixed securely to the elements being cured and joints in sheets shall be taped to prevent loss of moisture from the concrete. Care shall be exercised to prevent staining of exposed concrete.

Notwithstanding the preceding specifications, the Contractor shall also ensure that the concrete shall not be exposed to thermal shocks during the first 28 days after casting and he shall take the necessary, additional precautionary measures to shield the concrete with plastic sheets or hessian during extreme warm, cold or windy weather conditions. Hessian shall be wetted should the conditions necessitate this. Curing methods shall be such that saturation and subsequent damage to soil foundations is prevented.

The Contractor shall make allowance in his rates for the abovementioned curing methods. Where the Contractor fails to cure for a minimum of 10 days, no payment shall be made for the relevant pour of concrete and the Engineer may demand the removal and replacement of such concrete.

PSG5.5.9 Adverse weather conditions

No placing of concrete shall take place if the ambient temperature is below 5^{o}C, or exceeds 32^{o}C, or is likely to drop below 5^{o}C or rise above 32^{o}C during the casting period or within eight hours after casting is completed.

If concrete is to be cast during times of high ambient temperature or hot drying winds, the Contractor shall be responsible for taking the necessary steps to keep the placement temperature as low as possible. Such steps include the spraying of the coarse aggregate with water, the painting of silos with reflecting aluminium paint, the insulation of tanks and pipelines, and the protection of concrete ingredients against the direct rays of the sun. The area of the pour shall be shaded before and during concreting and the concrete shall be shaded from the time of mixing until eight hours after placing.

Windbreaks shall be erected if necessary.

PSG5.5.10 Concrete surfaces

PSG5.5.10.4 Screeded finish (Additional sub-clause)

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.

PSG5.5.10.1 (a) Wood-floated finish.

Where wood-floating is ordered or scheduled, the surface shall first be given a finish as specified in PSG5-6.1 and, after the concrete has hardened sufficiently, it shall be wood-floated, either by hand or machine, only sufficiently to produce a uniform surface free from screeding marks.

PSG5.5.10.1 (b) Steel-floated finish

Where steel-floating is specified or scheduled, the surface shall be treated as specified in PSG5-6.1 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.

PSG5.5.11 Watertight concrete

The floor, roof, columns and walls of the reservoir shall be constructed using watertight concrete. The Contractors shall abide by all conditions set out in sub-clause 5.5.11 and pay particular attention to this aspect of the works. The formwork/shutters shall be fastened using an approved imbedded fastening system. Open ferrules will not be permitted in the reservoir. No extra item shall be scheduled for payment under this sub-clause and the costs thereof shall be covered by the formwork and concrete rates.

PSG5.5.13 Grouting

“Unless otherwise specified on the drawings, grout for grouting holding down bolt pockets, column base plates or similar shall consist of either.....

i) an approved proprietary non shrink grout (without metallic aggregate), or ....
ii) a 2:1 sand cement grout mixed as dry as possible consistent with placing conditions.

Grout designated as dry packed shall be of such a consistency that it can be properly compacted by ramming. Where compaction by ramming is not possible, a proprietary flowable grout must be used. Grout shall have a minimum compressive strength at 20 days of 20 MPa”.

a) Water

Water for grout shall comply with the requirements given in Sub-clause 3.3 of SANS1200 G.

b) Aggregates

Notwithstanding the requirements of Sub-clause 3.4.1of SANS1200G, the grading of fine aggregate (sand) and coarse aggregate (stone or pea gravel) shall conform to the gradings given in Tables 1 and 2 respectively:

Table 1	
Test sieve nominal aperture size (mm)	**% Passing (by mass)**
9.5	100
4.75	95-100
1.18	46-65
0.3 9 (300 um)	5-15
0.15 (150 um)	0-5

Table 2	
Test sieve nominal aperture size (mm)	**% Passing (by mass)**
9.5	100
4.75	95-100
2.36	0-5

c) Cement

Cement shall be ordinary Portland cement complying with the requirements of SANS 471.

d) Admixtures

Admixtures shall comply with the requirements of Sub-clause 3.5 of SANS 1200 G and shall have a proven record of satisfactory performance. All admixtures are to be approved by Engineer.

e) Proprietary grouting materials

Unless otherwise approved by the Engineer, proprietary grouting materials shall be obtained ready mixed in sealed pockets as supplied by the manufacturers."

PSG5.5.14 Defects

All defects shall be repaired as soon as possible after the formwork has been removed and the Engineer has inspected the concrete. A statement of the method to be used for each repair shall be submitted to the Engineer for his approval before any work is carried out. The Engineer may prohibit the further placing of concrete in the particular area concerned until he is satisfied that the repair has been satisfactorily executed.

All honeycombing shall be repaired by cutting back to solid concrete and patching with a suitable epoxy mix to the approval of the Engineer.

PSG5.5.15.a Concrete records

For each casting the contractor shall keep records of:
(a) Time elapsed between mixing and casting of concrete
(b) Time elapsed between batches cast
(c) Slump test results of each batch

PSG5.5.15.16 "No-fines" concrete (Additional sub-clause)

A nominal aggregate size of 19 mm shall be used in the manufacturing of "no-fines" concrete. No fines concrete shall be laid under where specified and shall consist of coarse aggregate, cement and water only. No fine aggregate shall be used.

The concrete shall be mixed in the following proportions:

Cement	:	50 kg
Aggregate	:	0,40 m^3
Water	:	22,5 ℓ

The specified depth of the no-fines concrete shall be cast in one pour.

Between 24 h and 48 h after the no-fines layer has been laid it shall be covered with a 1:4 cement: sand mortar layer 20 mm thick. The mix shall be comparatively dry to ensure that it does not penetrate and block the cavities in the no-fines concrete. The surface shall be steel floated to form a plane surface. The mortar skim shall be cured in the same manner as concrete for a period of not less than 2 days.

Payment shall be per cubic metre of no-fines concrete placed. The rate shall include compaction and skimming to the approval of the Engineer.

PSG5.17 Items to be cast in or grouted into concrete (Additional sub-clause)

PSG5.17.1 Casting pipes and specials in concrete

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 himself.

The Contractor is responsible to ensure watertight fittings in the concrete to the Engineer's approval.

PSG5.17.2 Fixings for equipment supplied under separate contract

a) The Contractor will be responsible for the forming of pockets if applicable to holding down bolts for equipment supplied under a separate contract. Holding down bolts will be supplied by and positioned by others.

b) After casting of the concrete all shuttering shall be removed and the sides of the bolt holes and surface on which the machine base is to be placed shall be scabbled to remove all defective concrete, laitance, dirt, oil, grease and loose material.

c) Upon completion of the positioning and alignment of equipment and when instructed by the Engineer the Contractor shall in collaboration with the mechanical contractor, grout up pockets and baseplates by filling pockets and voids under the baseplates with an approved non-shrink grout.

PSG5.17.3 Fixings for items supplied under this Contract

Holding down bolts or other fixings required for the installation of items supplied under this Contract shall be provided by the Contractor. These fixings shall be cast in or grouted into pockets or installed by other means as approved by the Engineer.

Where anchor bolts are used which are installed into holes drilled into concrete or masonry these shall be of a type approved by the Engineer. All such bolts used shall be manufactured from stainless steel or a metal

with a resistance to corrosion equal to that of grade 304 stainless steel. The metal used for bolts shall be compatible with galvanized mild steel

Anchor bolts shall have minimum pull-out forces and minimum ultimate lateral loads at least equal to those specified below:

Specified Anchor Size	Minimum Pull-out Force (KN)	Minimum Ultimate Lateral Load (KN)
M6	10,35	7,60
M8	13,70	11,15
M10	19,44	15,95
M12	31,85	26,90
M16	50,45	45,80
M20	60,50	71,20

PSG5.18 Supervision

Prior to carrying out any concrete work, the Contractor shall obtain the approval of the Engineer in respect of:

(a) Structural programme
(b) Description of casting sequence
(c) Concrete plant details
(d) Materials to be used in concrete
(e) Details of concrete
(f) Construction joints

PSG7 Testing

PSG7.1.2 Frequency of sampling

One sample shall consist of three concrete test cubes.

For each sample taken the position in the structure shall be recorded where the batch represented by that sample is placed.

Sampling of concrete of a particular grade shall be as specified in Subclause 7.1.2 with the following frequency of sampling referred to in Subclause 7.1.2.2 being amended to read as follows:

"A minimum 2 samples for 50 m^3 (or less) of pour shall be taken for each grade cast on any day."

PSG7.2.4 Early-Strength Testing

7 day tests shall be performed on 1 sample for 50 m^3 (or less) of pour. These results shall be submitted to the Engineer as soon as possible after testing.

PSG7.4 Grouting (Additional sub-clause)

The Contractor shall, where so ordered, carry out a site test for each grouting procedure and each grouting gang to be used. The tests shall be carried out on a dummy bedplate similar in configuration to that which is to be grouted, but not exceeding 1 m^2 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. Test procedures shall comply with the relevant requirements of Subclauses 7.2.1 to 7.2.3.

PSG7.4.1 Concrete properties

Acceptance criteria for concrete properties are stated below.

PSG7.4.1.1 Water sorptivity and oxygen permeability

Table PSG 7.3.6.1 Water Sorptivity and Oxygen Permeability		
Acceptance Category	**Test No. / Description / Unit**	
	Water Sorptivity (mm/h)	**Oxygen Permeability (log scale)**
Concrete made, cured and tested in laboratory	6	> 10.0
Full acceptance of in-situ cast concrete	< 8	> 9.15
Conditional acceptance of in-situ cast concrete (with remedial measures)	8 - 15	8.75 – 9.15
Rejection	> 15	< 8.75

PSG7.4.1.2 Chloride conductivity

Table PSG 7.3.6.2 Chloride Conductivity (severe to very severe conditions)								
Concrete	**100% PC**		**10% CSF**		**30% FA**		**50% GGBS**	
Curing Period	**28d**	**90d**	**28d**	**90d**	**28d**	**90d**	**28d**	**90d**
Full wet cured	1.25	1.00	0.50	0.45	1.50	0.40	1.25	1.00
Moist cured (3 – 7d)	1.75	1.60	0.60	0.55	2.25	1.25	2.25	2.00

PSG7.4.1.3 Concrete cover

Table PSG 7.3.6.3 Concrete Cover			
Test Description	**Specified Cover (mm)**	**Acceptance Range**	
		Minimum	**Maximum**
Concrete cover to reinforcement	20 – 30	As specified	As specified + 5 mm
	30 - 80	As specified	As specified + 10 mm

PSG8 Measurement and payment

PSG8.1.1 Formwork

PSG8.1.1.7 Edges of blinding layer or "no-fines" concrete (Additional sub-clause)

No separate payment will be made for formwork to the edge of the blinding or "no-fines" concrete (refer to PSG5-10) layer. The rates tendered for concrete to the blinding or "no-fines" concrete layer shall cover the cost of such formwork.

PSG8.1.1.8 Kickers Unit: m^2

No separate payment will be made for formwork to the edges of kickers. The rates tendered for successive walls or columns formwork shall cover the cost of such formwork.

PSG88.1.1.1 & 8.1.1.2 Chamfers and fillets

No additional payment will be made for chamfers and fillets up to 40 mm wide. Larger fillets and chamfers will be measured by length in accordance with Subclause 8.2.5.

PSG8.1.2.2 & 8.1.2.3 Reinforcement Unit: tonne

Notwithstanding the method of measuring and paying for reinforcement specified in Subclauses 8.1.2.2 and 8.1.2.3, reinforcement will be measured and paid for as scheduled.

PSG8.1.3 Concrete Unit: m^3

The rates for concrete shall also cover:

a) the use of dolomitic aggregate where prescribed,
b) the cost of the preparation of design mixes by an approved laboratory and submission for approval by the Engineer (see PSG5-3.1),
c) the cost of non-designated joints (see PSG2-4),
d) screeded finish of unformed surface as specified,
e) inclusion of admixtures where specified, and
f) necessary admixtures to ensure watertight concrete.

PSG8.1.4 No-fines concrete Unit: m^3

No-fines concrete (refer to PSG5.5.15.16) will be measured by volume.

The rate shall cover the cost of supplying materials, constructing and placing in position the no-fines concrete, and shall include for the steel floated 20 mm mortar skim.

PSG8.4.4 Unformed surface finishes Unit: m^2

The rates for unformed surface finishes shall cover the cost of providing the respective surface finish as specified in PSG5-6.

PSG8.5 Joints

Only designated joints as shown on the drawings will be measured for payment according to the length of each type of joint constructed (see PSG2.4.3). The rate shall cover the cost of all materials, labour and plant required to construct each type of joint specified on the drawings, including the cost of all shuttering, treatment of the joint as specified in Subclause 5.5.7.3, the provision of chamfers as specified where concrete is exposed, as well as testing and repairing where necessary.

Non-designated joints will not be measured for payment.

PSG8.5.1 Formed joints Unit: m^2

Formed joints will be measured by the plane area of the joint.

The rates shall cover the cost of all operations and materials specified in Subclause 5.5.7 and PSG5.5.7.4, and detailed on the drawings such as joint filler, dowel bars and tubes, bitumen coats, etc., but excluding water stops or water bars.

Water stops and water bars will be measured by length separately for each type.

PSG8.5.2 Holding down bolts Unit: No.

Fixing of holding down bolts will be measured by number. The rate shall cover the cost of all things necessary to ensure that the bolts are effectively and rigidly held in position during casting, complete with sleeved pockets, all as detailed on the drawings.

PSG8.7 Grouting Unit: m^3

Grouting of base plates and equipment bases will be measured by the volume of grout used.

The rate shall cover the cost of the supply and floating in of grout under the plates to ensure solid and complete filling of the gap.

PSG8.9 Items cast in concrete Unit: No.

Items cast in concrete will be measured by number separately for each type of item.

Notwithstanding Subclause 8.2.6, the rate shall cover the cost of fixing in position and casting in the item as construction proceeds, irrespective of whether the Contractor chooses to fix the item in the formwork and cast it in directly or to box out a hole and grout the item in subsequently.

The item will be measured and paid separately.

PSG8.10 Precast concrete cover planks Unit: m^2

Precast paving slabs will be measured by the area paved.

The rate shall cover the cost of compacting the area, application of weed-killer, supplying, laying and bedding the slabs, grouting the joints and filling any gaps, all as specified.

PSG8.11 PFA concrete

Measurement and payment for PFA concrete shall be as specified in Subclause 8.1.3.

The tendered rate shall cover all costs in connection with the supply, storage, handling on site and mixing in of PFA.

PSG8.12 Poly-urethane sealants Unit: m

A one part polyurethane sealant shall be used in the outside joint between the reservoir roof and walls to the details shown and shall be finished off neatly leaving a smooth regular finish.

Payment shall be per linear metre. The rate shall include the supply, preparation, sealing and finishing.

PSG8.13 Manhole covers Unit: No.

Manhole covers shall be paid per unit.

PSG8.14 Commercial Laboratory Unit: Prov Sum

A Provisional Sum for the services of a commercial laboratory has been included in the Bill of Quantities for the Engineer's Acceptance Testing. The use of this laboratory is for additional testing required over and above the testing specified in SANS 1200 G and the variations to SANS 1200 G specified above. Testing shall only be paid on written instruction for additional testing from the Engineer.

The procedure for sampling and manufacturing, storing, curing and testing cubes shall be in accordance with SABS 863.

SANS 1200 HA STRUCTURAL STEELWORK (SUNDRY ITEMS)-PSHA

PSHA3 Materials

Where the words "Structural Steelwork" appear in the heading and in other relevant Clauses, amend to read "Aluminium, Stainless Steel and Structural Steel".

PSHA3.1 Structural steelwork

Structural steelwork shall comply with Grade 43 of BS 4360.

- All steel for structural steel work to be to Grade 300W to SABS 1431.
- All steel for handrails and ladders are to be manufactured from Grade 43 A (to BS4360) or Grade 300W (to SABS 1431) or stainless steel grade 304 L as specified.
- The steel shall either bear the standardized mark from the relevant institution or the contractor shall submit proof of the grade of steel use in manufactured structural components

PSHA3.1 Paints and Protective Coatings

Shop Painting

a) Steelwork shall be wire brushed after fabrication to leave a smooth finish free of rust, scale, grease or any substance deleterious to the final protective coating.
b) Within 4 hours after the completion of wire brushing, a red lead paints to SABS 312, Type II, Grade II shall be applied to provide a dry film thickness between 25 and 30 micron (under normal conditions two coats will be needed). Red lead shall not be sprayed but shall be applied by brush or roller.

Painting after Erection

a) After erection all areas where the primer coat has been damaged shall be touched up as specified in **C_S-6.3.7**
b) As intermediate coat of a general purpose alkyd undercoat shall then be applied to a dry film thickness between 25 and 30 micron. The undercoat shall conform to SABS 681, type 1.
c) One coat of approved alkyd enamel shall be applied 24 hours after the application of the immediate coat. The coat shall be as per SABS 684 type B and shall provide a dry film thickness between 25 and 30 micron.
d) The colour of the final coat shall be Light Admiralty Grey (CKS 279 no p.16), unless otherwise specified.

Galvanizing

- Where galvanizing is specified it shall be carried out by the hot dip process in accordance with SABS 763-1977 (or latest amendment).
- The minimum thickness of the zinc coating shall be for general application and shall in all cases be at least 65 micron, thus giving a minimum equivalent mass per unit area of 455 g/m^2.

Epoxy Enamel

- Where an epoxy enamel coating is specified the coating shall be applied through spraying in a workshop to final enamel thickness of at least 150 micron (0.15 mm). The type to be used shall be:

"Crown Cebestos: Copon EP 2300", or similar approved.

- Following installation the section shall be checked for any chips or scratch marks and shall be made good on site with brush applied epoxy enamel.

Welding

- Welding shall be done in accordance with the relevant recommendations of SABS 0162, BS 5135 and AWS D 1.1-81 (American Welding Society)
- Welding shall be Grade B welding.
- The qualification if welders shall be in accordance with the relevant clauses of the above standards, and specifically SABS 044 part III and shall be Grade 1 welders. Grade 2 Welders shall be permitted only with the Representative of the client's approval.
- The Contractor shall provide evidence, acceptable to the Representative of the client, that welding procedures and welders have been tested in accordance with the requirements of AWS D1.1.
- No welding shall be permitted on site without the express approval of the Representative of the client, with the exception of those details shown on the drawing as site welded.
- No oxy-acetylene or other gas cutting and bending will be permitted on site without the Representative of the client's approval.

Erection Procedures

- The setting out of all holding-down bolts shall be accurately checked by the Contractor. Any discrepancies in excess of the permissible deviations of the positions of these bolts shall be reported immediately to the Representative of the client.
- The Contractor shall not be permitted to make any relevant adjustment in the steelwork without the Representative of the client's approval. Methods to select or treat materials may be employed by the Contractor to the satisfaction of the Representative of the client.

PSHA3.1.1 Stainless steel

All stainless-steel items shall be Grade 304L material.

- Stainless steel pipe shall be welded austenitic stainless steel grade PSW_304L to ASTM A312, wall thickness to Sch10s or Sch40s as specified, dimensions to ANSI B36.19

PSHA3.1.2 **Aluminium** (Add Subclause)

All aluminium items shall be grade M57S material anodized in accordance with SABS 199 Grade 25.
Hot metal sprayed coatings shall be in accordance with SANS 2063 and the minimum thickness for both aluminium and zinc is 150 □m

PSHA3.3 Bolts and nuts

All bolts, nuts and washers within water retaining structures or exposed to the rain, or with a diameter of 10 mm or less, all anchor bolts of any size in concrete or brickwork and all bolts of any size used in conjunction with stainless steel items, shall be manufactured from Grade 304L stainless steel.

All other bolts, nuts and washers with a diameter of 12 mm or greater shall be hot dip galvanized to SABS 763. Nuts shall be tapped before galvanizing, taking into consideration the extra clearance necessary to allow for the thickness of galvanizing on the bolts. If, after installation, there is any indication that galvanising has been stripped from either the nut or the bolt, both nut and bolt shall be removed and replaced.

PSHA3.5 Access ladders

Access ladders shall be constructed and installed as per detail drawings. Access ladders shall be fixed to the walls using chemset bolts. The necessary precaution shall be taken to ensure watertightness of the walls. Ladders shall be stainless steel grade 304L

PSHA3.6 Vermin proof flaps (Add Subclause)

Vermin proof flaps shall be made of stainless steel.

PSHA4 Plant

The Engineer may request at any time the mill certificate of the steel supplier.

All components shall be pre-fabricated in an Engineer approved steel fabrication yard. No site fabrication or welding will be permitted.

PSHA5 Construction

PSHA5.2.4 Welds

All welds shall be fully continuous and not less than 6mm across the throat. All welds shall be continuous welds and site welding must be kept to a minimum and approved by the Engineer. The welding consumables shall be to the standard as set out in MS5.1. All stainless steel welds shall be pickled & passivated

PSHA5.2.5 Bolts

PSHA5.2.5.1 Materials

1) M12 & smaller
   - All 316 stainless steel
2) Larger than M12
   - In corrosive environment — 316 stainless steel
   - In non-corrosive environment — 304 stainless steel or hot-dip galvanized if specified
   - High tensile bolts & nuts — Hot-dip galvanized & painted
   - Anchor fasteners — 316 stainless steel
3) Washers
   - Washers shall be of the same material as the associated bolt & nut
4) Anti-Seize Compound - Refer to **M_S4**

PSHA5.2.5.2 Thread Projection

- Bolt thread projection outside of the nut shall be **≤ 6 mm**

Before assembly, all bolts shall be coated with an approved nickel based Anti-seizure/corrosion protection compound.

Two washers shall be used with every bolt and nut to prevent damage to coatings.

PSHA7 Testing

All welds shall be crack tested using die indicators.

PSHA8 Measurement and payment

PSHA8.3.6 Corrosion protection

Notwithstanding the requirements of Subclause 8.3.6, corrosion protection (painting and galvanizing) will not be measured separately, the prices tendered for the steel items being held to include for the cost of corrosion protection as specified.

PSHA8.3.7 Stainless steel manhole frame and cover Unit: No

Sub-clause PS HA 5.4 applies to this payment item.
The rate shall cover all costs for the manufacture, supply, installation and casting-in of the frame into the surrounding concrete complete with locking device and padlock.

PSHA8-3 Reservoir roof ventilation pipe complete Unit: No.

Sub-clause PS HA 5.5 applies to this payment item.
The rate shall cover the costs for the fabrication, galvanising, casting-in and installation of the ventilator pipe to its completion.

PS HA 8.4 Stainless steel cat ladders inside the sump Unit: Lump Sum

The rate shall cover the manufacture, supply, installation and commissioning of the ladder, including all fixing features, complete."

PSHC CORROSION PROTECTION OF STRUCTURAL STEELWORK
(SANS 1200 HC)

PSHC5 Construction

PSHC5-1 Structural steel

All structural steel members shall be hot dip galvanized.

PSHC5.11 Floor panels, handrails, ladders and the like (Add Subclause)

The open grid and chequer plate flooring panels and frames, handrails, ladders and similar items shall be hot dip galvanized in accordance with the requirements of Subclause 5.9.

In addition, handrails shall be degreased, primed and painted yellow with two coats of recoat-able polyurethane to a minimum total dry film thickness of 70 micrometres after installation.

PSHC6 Tolerances

PSHC6.6 Film thickness tolerances

PSHC6.6.1 Individual coatings

At least 90% of all thicknesses measured shall comply with the minimum thickness of the system specification. Up to 10% of all readings may be below the specific minimum thickness, but no reading shall be less than 70% of the specified minimum thickness.

PSHC6.5 Total dry film thickness

Not more than 10% of readings shall be less than the minimum specified and no reading shall be less than 90% of the specified minimum. For immersion conditions no reading shall exceed the mean specified thickness by greater than 60% of the minimum, unless a concession is granted by the Engineer.

PSHC8 Measurement and payment

PSHA8.3.6 shall apply.

SABS 1200 LB: MEDIUM PRESSURE PIPELINE PS LB

PS LB 8.3 Materials

PS LB PVC-O Pipes

- All PVC-O 500 water pipes shall be Class PN 12.5 pipes manufactured to the following standard: ISO 16422-Parts 1,2,3 & 5, 500 orientation, or to SANS ISO 16422:2016, 500 orientation.
- Plastic fittings & Bends shall be manufactured from uPVC piping, class 16 that conforms to SANS 4427-2, the butt fusion machine to SANS 1671-1 and the manufacturing process to SANS 10268-1. The dimensions of Segmented or swept bends shall conform to SANS 4427-3. **The manufacturer shall incorporate the derating values for the material on the segmented bands and Tees**. Materials for Steel bends and fittings shall comply with SANS 719.
- Pipes and fittings will be tested to a pressure of 15 Bar and all fittings must withstand this pressure without exceeding the limit as percentage of factory test pressure as given in SANS 1200L paragraph 7.3.1.4.

PS LB Steel Pipes

- All steel pipes shall be to SANS 719 Grade B steel (300W) with t = 4.5 mm minimum.

PS LB Stainless steel Pipes

- Stainless steel pipe shall be welded austenitic stainless steel grade PSW_304L to ASTM A312, wall thickness to Sch10s or Sch40s as specified, dimensions to ANSI B36.19

PS LB Ducts or Sleeve Pipes

- Sleeve pipes manufactured from uPVC shall comply with SANS 791 standard
  Corrugated sleeve pipes shall be manufactured from HDPE to BS EN: 50086-2-4 standard

PS LB Sub-surface Drainage Pipes

- Sub-surface drainage pipes shall be off the slotted type with a smooth inner wall. The pipes shall preferably be manufactured from HDPE (flexible) or uPVC material
- The pipe, properly bedded, shall withstand a load of 150 kN/m
- The impact strength for the HDPE & uPVC pipes shall exceed the minimum requirements of DIN 4262 Part 1.

PS LB Valves (Sub-clause 3.10)

- All valves shall generally conform to SABS 664. Valves shall be **class 10** with flanged ends, flanges drilled to **SABS 1123 Table 1000/3** unless otherwise indicated in the schedule of quantities or on the drawings.
- Only valves supplied by a manufacturer on the list of UDM and approved by the representative of the client shall be used under this contract and no orders may be placed until the Representative of the client has given written consent.
- Sluice valves shall be of the full way gate type with non-rising spindle and wedge closing door. The valves shall be fitted with square caps for operation by T-keys and shall close in clockwise direction. The gate must be able to open and close under an unbalanced pressure equal to 10 bar.
- Resilient seal gate valves shall be provided with a straight, unobstructed body passage without any pocket and the gate shall be completely clear of the waterway in the fully open position.

Valve Materials

Body and bonnet	:	Spheroidal graphite, grey cast or ductile iron.
Valve gage	:	Sluice valves: Stainless steel or gun metal
RESILIENT SEAL	:	Cast iron covered with nitrile, EPDM or similar rubber
Spindle	:	Stainless steel or approved metal compound
Spindle seal	:	Double O ring plus wiper ring to prevent ingress of dirt.

The spindle in all cases shall be non-rising with a capped top. All valves shall be clockwise closing.

Air Valves (water)

- The material and workmanship employed in the manufacture of air valves shall be of a similar standard to that set out in SABS 664-1974 for sluice valves.
- Air valves of the single orifice type are required, suitable for withstanding the test pressures as specified with a working pressure up to two thirds of the body test pressure.
- Single air valves shall be only of the small orifice type, with a tapped inlet and fitted with chromium plated for isolating purposes.
- The DIRECTION of ROTATION on vertical spindle shall be CLOCKWISE on CLOSING.
- A full and illustrated description and specification including dimensions of the air valves shall be submitted at the time of tendering. The design must be such as to preclude any possibility of the large orifice blown shut by the passage of air during filling of the pipeline.
- Double air valves shall be fitted with stainless steel balls.

PROJECT SPECIFICATION: PORTION 2

SABS 1200 LC: CABLE DUCTS

PS LC 10.3 Materials

- The civil contractor shall install all electrical, irrigation and any other specified ducting as indicated on the drawings
- The ducting shall be manufactured from virgin HDPE material to the BS EN: 50086-2-4 standard. The colour of duct for electrical cables shall be green, irrigation, yellow & others, black
- The nominal diameter is 110 mm (minimum) with an inside diameter of 95 mm or 160 mm with an inside diameter of 137 mm.

✺ **Cable Duct Markers**

- The Contractor must allow for a marker at all ducts. The marker on both sides of the opening of the duct shall be a plastic tag, 50 X 30 X 2 mm thick tied to a 3 mm Ø nylon rope with the rope drawn through the length of the duct. The plastic tag shall have the same colour as the duct.

SABS 1200 LD: SEWERS

PS LD Materials

✺ **Pipes**

- The short sections of on-site sewer pipes shall be uPVC solid wall class 34 or structured wall, class 400 sewer pipes, to SABS 791

✺ **Manholes**

- Precast concrete sectional spun-concrete cylinders shall be manufactured from dolomite aggregate
- The joints between ring sections shall be rendered watertight by placing a **Pro-Struct epoxy layer** between joints.
- All manholes are 1m diameter precast manhole rings

SABS 1200 LE: STORMWATER DRAINAGE

PS LE 3 MATERIALS

PS LE 3.1.1 Material for Subsoil Drainage

PS LE 3.1.1.1 Pipes

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

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

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

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

PS LE 3.1.1.2 Crushed stone

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

PS LE 3.1.1.3 Geotextile Blanket

The geotextile blanket around subsoil drains shall comply with the requirements of PS DK 3.1.4 in all respects.

PS LE 3.1.1.4 Sand

Sand obtained from approved commercial sources shall be clean, hard and durable and shall comply with the following grading requirements:

D15 : 0,2 mm to 0,4 mm
D85 : 1,2 mm to 4,7 mm

PS LE 5 CONSTRUCTION

PS LE 5.1 Trench Bottom

PS LE 5.1.3 Unsuitable Founding Conditions

Substitute "90 % of MAASHTO maximum density" in LE 5.1.3 with "90 % of MAASHTO maximum density (100 % for sand)".

PS LE8.2 BEDDING AND LAYING

PS LE 8.2.14 Supply and Install Subsurface Drains According To Drawings ..... Unit: m

The length shall be measured 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.

SABS 1200 ME: SUBBASE

PS ME 13.3 Materials

- The subbase material shall have a minimum GM of 1.5
- The plasticity index PI shall not be greater than 10 for natural material and not more than 3 for stabilized material
- A minimum CBR of 45 is required for natural material

All of the subbase material shall be obtained from commercial sources

SABS 1200 MJ: SEGMENTED PAVING

PS MJ 14.3 Materials

Class, Strength and Type

- The inter-locking blocks for the entrance road shall be 80 mm thick, grey colour class 30 Mpa blocks
- The inter-locking blocks on the terraces at all the structures shall be 60 mm thick, grey colour class 25 Mpa blocks
- Edge restraints will be 35/13 MPa concrete cut at 1 m intervals.

PSMJ-14.4 Construction

The paving blocks at the entrance road must be locked up with at least 5 passes with a heavy pneumatic roller.

SABS 1200 MK: KERBING AND CHANNELLING

PS MK 14.1 Materials

Precast Kerbing and Channeling

- The standard length of a precast section shall be 1000 mm
- Sections used on curves shall be 300 mm long
- The maximum length between expansion joints is 3 m

PARTICULAR SPECIFICATION: PA

PA BRICKWORK AND PLASTER

PA1 SCOPE

PA1.1 This specification covers the general requirements for buildings and other masonry structures, including plastering.

PA2 INTERPRETATION

PA2.1 Other relevant Standards/Specification

This specification should be read together with SABS 1200 AA.

PA2.2 Applicable Edition of Standards

Each standard specification referred to in this specification shall be deemed to be the latest edition, applicable on the tender closing date.

PA2.3 Definitions and Symbols

For purposes of this specification, the definitions and symbols given in the National Building Regulations and Building Standards Act, 1977 (referred to further on in this specification as "Building Act"), where applicable, shall apply. (Definitions: pages 5 to 14, Symbols: page 23.)

PA3 MATERIALS

PA3.1 Cement

Cement shall conform to the requirements of SABS 471.

PS3.2 Lime

Lime shall be of approved manufacture, well burnt and of uniform quality conforming with SABS 523.

PA3.3 Sand

Sand to be used for mortar and plaster shall comply with the requirements of SABS 1090.

PA3.4 Clay Bricks

Clay bricks must conform to SABS 227. A sample of bricks to be used for construction must be given to Engineer for approval before construction bricks are delivered to site.

The contractor will be required to carry out necessary tests and provide certificates for compliance of the bricks with SABS 227. The cost of these tests will be deemed part of the scheduled rates and no additional payment will be made therefore.

Best quality engineering bricks shall be used for all foundation and concealed situations.

PA3.5 Damp-Proofing

Material used as a damp proof course shall conform to the requirements contained either in SABS 248 or in SABS 952. Type FV fibre-felt sheets or Type C polyethylene sheets shall be supplied under the contract.

PA3.6 Fibre Cement Sheets

Fibre cement flat sheets, minimum 15 mm thick, shall comply with the requirements of SABS 685.

PA3.7 Storage

PA3.7.1 Cement and Lime

Cement and lime stored on the site shall be properly protected against moisture to the satisfaction of the engineer.

PA4 CONSTRUCTION

PA4.1 Brickwork

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 dampened before laying and each brick is to be laid with full joints and pressed into its bed so as to squeeze out superfluous mortar and give a finished joint not exceeding 8 mm thick in the case of the face work or 13 mm thick in the case of plastered walls or work not exposed to view.

All joints, both horizontal and vertical, notwithstanding any grade 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 joints and vertical joints of face work shall be pointed flush in manholes and catch pits, but shall be pointed and finished with a tooled recessed joint elsewhere. Plastered walls shall have the joints raked out to a depth not less than 13 mm and not more than 20 mm, and subsequently refilled with mortar of the same proportions as the original bedding mortar. In no circumstances may joints to be so formed as to expose any perforation in the units.

Wire ties, where required, shall be stainless steel and are to be installed at 5 per square metre.

PA4.2 Mortar

The mix proportions for the mortar are given below:

Portland cement	50 kg
Lime	0-40 l
Sand*	200 l max.

* measured loose and damp

PA4.3 Plastering

Plaster shall be of the same proportions as the bedding mortar. Any other plaster mixes will be subject to the approval of the Engineer.

PA4.4 Damp Proof Courses

The areas to be covered by damp proof courses are indicated on the drawings. Damp proof shall be laid on a surface which shall not contain any sharp objects which may perforate the membrane. The full width of the wall and the whole area under the floor is to be covered by the membrane and shall overlap by not less than 100 mm under the floor, and by not less than 150 mm under the wall. All joints shall be effectively sealed. Where shown on the drawing, the damp proof course is to be stepped up one course of brickwork in the inner skin.

PA4.9 Floor Finishes

PA4.9.1 Granolithic Floor Screed

Granolithic shall consist of one part cement, one part sand and two parts 5 mm stone chips and oxide where required, thoroughly mixed as for concrete and placed in a layer not less than 20 mm thick, levelled or graded and trowelled to a smooth uniform surface. To ensure proper bond, the concrete surface to be covered shall be clean, roughened by chipping, flushed with water and coated with cement grout just before placing of the granolithic layer. Granolithic finish is to be steel floated with V joints in squares of 1,20 m to 1,80 m, the joints extending for the full depth of the granolithic. Joints are not required in the granolithic screed where it is to be overlaid by tiles or carpeting.

PA4.11 Weather

In any period of interruption caused by inclement weather, and at the completion of each day's bricklaying, freshly laid brickwork should be protected.

M_S -MECHANICAL WORKS

Part M_S: STANDARD SPECIFICATION

PART M_S - STANDARD SPECIFICATION

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M_S27 LIFTING EQUIPMENT

M_S1 GENERAL

The Standard Specification for the manufacturing standards of various mechanical equipment items normally included in the process design of a Wastewater Treatment Plant will apply in general to all relevant items. The Particular Specifications give more detail of the standard requirement of a specific mechanical item and may add to or supersede a Standard Specification.

M_S2 SITE OPERATION CONDITIONS

$M_S2.1$ Climate

- KZN inland + 60 km from the coast
- MAP = ± 1200 mm/annum
- Bush & forestry area

$M_S2.2$ Environment

- Close to environmental sensitive area
- Large agitated open water areas on site - liquid or foam spray - corrosive environment
- Harmful gasses generated by microbial life in sewage may be present (H_2S) - very corrosive to ferrous & some non-ferrous metals

M_S3 DESIGN CONSIDERATIONS

$M_S3.1$ Safety Requirements

- Safety to operational and maintenance staff shall be the most important design factor for any mechanical item supplied.

The regulations of the Occupational Health & Safety Act, Act 85 of 1993, shall be strictly applied. All mechanical equipment normally needs safeguarding elements like belt, chain or rotating shaft guards, protrusion caps, safe space from handles, levers and heated elements for human movement.

- An **emergency stop button** shall be installed at all electrical or fossil fuel driven mechanically equipment at an easy accessible position
- Any installations on site considered unsafe by the Engineer (employers representative - latest GCC) shall be corrected by the Contractor at no extra cost to the employer

$M_S3.2$ Design Requirements

In the design/re-design of any equipment to be supplied under a specific contract the essential design requirement are:

- The manufacturer must proof that the materials used in manufacturing of a product is from a reputable supplier and complies with a specified standard
- Equipment delivered to site shall have certified proof of product duties, performance curves, output, power requirements, efficiency factors, temperature operating range and design life cycle and the supplier must make provision for verification tests of products as schedule in the SoQ (pumps, blowers etc.)
- Service & Safety factors shall be adhere to in the design as laid down in local or international standards
- A safety margin of 20% over and above service and safety margins applicable is recommended

- Products should be rated for 24 hour operation per day except where specified as a standby unit with less running time per day required. In such a case the manufacturer must specify maximum duration of running time per operation cycle
- A minimum life of 100 000 hours must be adhere to for all components before major repairs or replacement is required
- Where a certain element of a product is more likely to fail due to poor maintenance or incorrect human intervention the designer must include precaution or automatic warning indicators to prevent catastrophic failure and danger to life - **fail safe design**
- All drive motors of mechanical equipment shall inter alia have the following safety measures:
  - Emergency stop or prevent from starting when maintenance or repairs are underway on the specific equipment
  - A flashing light indicator or an alarm on the main switchboard or mimic (mini SCADA) display whenever the protection is operational
  - **No** un-qualified or un-authorized person to do repairs or maintenance work on any equipment
  - **No** un-authorized access to any operational equipment on site. Any access to site to be approved by plant owner (local authority etc.)
  - Material selection for moving or rotational parts of any drive motor or mechanical machine to be such that a motor can be started after a **long non-operative** period
- The on-site environment of any product associated with wastewater shall be deemed severely corrosive
- It is important to supply and install the necessary adjustment equipment (levelling -, adjustment guide bolts or screws) where accurate alignment of shafts, chains, pulleys etc. are required
- All heavy machinery or electrical equipment must be provided with lifting hooks or lifting fittings that the equipment can be off-loaded by crane and positioned by overhead manual or electric driven hoist.
- The detailed drawings for all mechanical equipment with the associated final securing and fastening positions shall be issued before the civil construction for the pockets or holding down positions of fasteners are finalized
- The mechanical contractor must allow for installation tolerances where mechanical equipment must be install against a wall for support purposes
- Corrosion
  - The contractors shall at all times in the position to supply certification that any coating specified was applied according to the associated specification and standard
  - On site coatings shall be witnessed by a specialist coating supplier and a certificate of compliance issued to the Representative of the Client
  - Access to all equipment areas (pipes, machines, outside metal surfaces etc.) that will be scheduled for re-painting during design life maintenance must be given attention in the design for accessibility

M_S4 REFERENCE TO PRODUCT BRANDS

In the Bill of Quantities (BoQ) reference is made in various occasions to well-known product brands available in South Africa. This is just to assist the novice tenderer as a guide to the type of product required. It is not at all a tender specification and any similar product that complies with the specification, with a good track record in South Africa and **freely available spares and service agents**, is acceptable.

M_S5 INSTALLATION REQUIREMENTS

- The Contractor must include in his tender all fixing equipment like holding down bolts, pipe and machinery supports, hangers, brackets etc.
- After installation every installed item shall be true aligned, correctly supported where applicable, level if specified, **tested** for miss-alignment vibrations and successfully commissioned before signed-off by the Engineer
- Designed and manufactured spacers (stainless steel) are preferred for alignment of motors and machines and the use of shims must be approved by the Representative of the Client (Engineer). If shims are approved the amount use per single fixing point is restricted to 3 maximum
- **A nickel anti-seize or anti galling paste (CHESTERTON 725 or SPANJAARD to MIL-A-907E product or similar) shall be applied to all stainless steel bolt threads before fastening of nuts to prevent metal fusion over an extended period of time**. Several suppliers of anti-seize agents warned against the use of copper paste on stainless steel due to the long term cracking or disintegrating effect on stainless steel
- Alignment of motor shafts to pump shafts for larger electrical motor shall be with laser lighting equipment and execute by alignment specialist
- The use of pourable epoxy (not less than 20 mm chock thickness) is acceptable

M_S6 MATERIALS

$M_S6.1$ Steel

1) Carbon Steel

All structural steel shall comply with the specifications of SANS 1431 grade 300W.

Steel sections delivered to the contractor shall be properly mark with specification and manufacturers identity markings. The contractor must make provision to grant the Engineer permission for material inspection at the contractors manufacturing yard.

2) Stainless Steel

- The specific grade of stainless steel for a specific product is specified in the **Particular Specifications** (**M_p**).
- The most commonly used and specified stainless steels are the austenitic (Cr-(Mn)-Ni) group. The basic grade is 304.
- Columbus Stainless Steel in Middelburg - Mpumalanga manufacturer grade 304 & grade 316 to the following specifications:
  - ASTM A240
  - ASME SA240
  - EN 10088-2
  - EN 10028-7

If the stainless steel is subject to welding the carbon content in the material composition is lowered with an **L** indicating the weldability grade.

- For a waste water treatment plant application where the corrosion potential is very high the recommendation is:
  - No welding required Grade 316
  - Welding required Grade 316L

In a less corrosion environment:

- No welding required Grade 304
- Welding required Grade 304L

- SASSDA recommend the following welding consumables for the specific grade:
  - Grade 304 Grade 308L
  - Grade 316 Grade 316L/318
- Surface Preparations/Finish

Rolled material shall be supplied with a matt, annealed and pickled finish. All welded material shall be pickled & passivate after welding.

3) 3CR/12 Steel (Ferritic stainless steel)

- Columbus Stainless Steel in Middelburg - Mpumalanga supplies 3CR12/3CR12L to the following Mill Specifications:
  - ASTM A240 (S41003 & 410S)
  - EN 10088-2
  - EN 10028-7 (1.4003)
- SASSDA recommend the following welding consumables:

3CR12 SS Grade 309L

The weldability of the rest of the grades of Ferritic Stainless Steels are poor

- Surface Preparations/Finish

Rolled material shall be supplied with an annealed and pickled finish. All welded & non welded material shall be pickled & passivate after welding.

- Surface Coatings

All 3CR12 products specified in the Particular Specifications (M_P) shall be coated or painted as specified

M_S7 WELDING OF STEEL

$M_S7.1$ Welding Standards

The following standards shall be adhere to and any new Standards as recommended by SAIW

- EN 1011-2 Arc welding ferritic metals
- EN 1011-3 Arc welding stainless steel
- BS 4677 Arc welding austenitic stainless steel piping
- BS 2633 - Class Ⅰ Arc welding of steel pipework
- BS 2971 - Class Ⅱ Arc welding of steel pipework

$M_S7.2$ Carbon Steels

- All welders shall be qualified and experience welders

- The qualification of welders shall be to the standard as set out by SAIW
- All welds shall be continuous welds and site welding must be kept to a minimum **and approved by the Engineer**
- Crevices shall be sealed with an approved coal tar product that can be applied to a thickness up to 0.1 mm

M_S7.3 Stainless Steels

- All welders shall be qualified and experience welders
- The qualification of welders shall be to the standard as set out by SAIW
- Refer to M_S5.1 **2)**: The austenitic stainless steel to be welded shall be to the class **L** witch indicated the lower carbon grade
- The welding consumables shall be to the standard as set out in M_S5.1

M_S8 CORROSION PROTECTIONS: COATING & PAINTING OF MANUFACTURED MATERIALS

M_S8.1 Materials to be Coated or Painted

- All ferric steel products shall be coated or painted as specified in the Particular Specifications (**M_P**)
- All 3CR12 Stainless Steel products shall be coated or painted as specified in the Particular Specifications (**M_P**)
- 304L Stainless Steel products shall only be coated or painted **if** specified in the Particular Specifications (**M_P**)
- 316L Stainless Steel products do not have to be coated or painted unless otherwise specified
- All hot dipped galvanized products
- **All stainless steel welds shall be pickled & passivated**

M_S8.2 Painting or Coating Contractors

- Only suitable qualified and experienced painting or coating sub-contractors shall be used by the mechanical contractor. The mechanical contractor must obtain all certifications and approved quality control procedures from the sub-contractor to supply to the Engineer on request. The premises of the sub-contractor shall comply with all municipal by-laws and health & safety regulations. Updated documentation regarding the compliances shall be available from the sub-contractor at any time and the mechanical contractor must verify these records before any work is sub-contracting.
- The Mechanical Contractor shall forward the detail and name of the painting or coating sub-contractor in advance to the Engineer for record keeping

M_S8.3 Quality Control of Painting or Coating System

Most painting failures on newly painted surfaces can be traced back due to non-standard or poor pre-paint surface preparation

- Quality Control Items to be monitored
- The Contractor must have available Quality Control Plans & Quality Control Records for all painting or coating applications on products supplied from:
  - Manufactured and supplied by the Contractor

- Manufactured and supplied to the Contractor by other specialist manufacturing companies (pumps, electrical motors, instrumentation etc.)

- Acceptance of surfaces for coating - ISO 12944-3 where applicable
- Surface preparations in accordance Section 4 - SANS 10064 & ISO- 3a3 ISO 8501
- The first coat of primer/paint shall be apply not later than 4 hours after cleaning **and for coastal areas not more than 2 hours after cleaning**
- The dry film thickness for any individual coat of any coating system shall be determined accordance SANS ISO 2808
- Relative humidity shall be recorded with a calibrated humidity meter
- Hot-Dip Galvanizing shall comply with SANS 121 with the thickness as specified
- Damage of hot-dip galvanizing by grinding, welding or erection procedures is not acceptable
- Hot metal sprayed coatings shall be in accordance with SANS 2063 and the minimum thickness for both aluminium and zinc is 150 μm
- Steel sections encased in concrete shall be painted to ± 50 mm below the concrete top level and enough bare metal must be allowed for to form an air free bond with the concrete

M_S9 PAINTING & COATING

$M_S9.1$ General

- Paint shall only be applied strictly to the manufacturer's instructions and complying with specified minimum & maximum temperatures, relative humidity, windy or dusty outside or inside conditions and the correct application equipment.
- Steel sections imbedded in concrete shall be painted that the painted section shall be submerge below the concrete level not more than 50 mm to allow for a proper bond between the concrete and the bare steel section
- The applied paint or coating layer shall comply with the Specified thickness or manufacturer's recommended thickness. The measured layer thickness should comply 90% of the time with the specified thickness.
- Painted or coated areas damaged during loading & offloading of equipment shall be cleaned with a wire brush or fine sand paper and the same type of primer, paint or coating shall be applied. The paint or coating around the damage area shall be feathered to make for a good blend in of the repair coating.

$M_S9.2$ Colour Coding of Pipework & Machinery

After installation of all machinery and pipework on site the machinery pulley, chain and rotating shaft guards and **exposed** pipework must be painted or sprayed with a continuous, smooth finish final coat that is compatible with the applied paint or coating. Colours shall comply with the National Colour Standard, SANS 10140.

A summary of the basic items and recommended colours are as follows:

1) Water & Waste Water Piping

• Potable - Cold	Brilliant Green	(H10)
• Potable - Hot	Brilliant Green	(H10)
• Final Treated Effluent	Aquamarine	(E67)

• Raw Sewage	Light Olive Green	(H21)
• Primary Sludge	Dark Brown	(B03)
• Waste Activated Sludge	Light Brown	(B15)
• Chlorine	Light Stone	(C37)
• Chlorine Gas	Canary Yellow	(C61)
• Scour Pipes	Deep Buff	(B24)
• Visible Valves	Same as Pipeline	
• Fire Fighting Equipment & Pipework	Signal Red	(A11)

2) Machine Guards

• Inside	Light Orange	(B26)

3) Handrails

• Horizontal Rails & Chains	Golden Yellow	(B49)
• Stanchions	Black	

4) Mechanical Equipment

• Pulleys, Fans etc	Light Orange	(B26)
• Baseplates	Black	
• Hand wheels	Black	
• Bridges for settling tanks (3CR12 & Steel)	Light Admiralty Grey	(E46)
• Bulk Mechanical Equipment	Light Grey	(G29)

M_S9.3 Painting System for Steel Fabrications

1) Immersed, tanks & Pipes (surface preparation ISO-Sa3)

- 3 x Coats of low solvent, high solids, polyamine/amide cured epoxy (two part)
- Dry film thickness = 350 μm

2) Same as 1) with Non-chalking Surface

- Add one coat of polyurethane (two part) over and above the 350 μm application in 1
- Polyurethane Dry film thickness = 40 μm

3) Same as 1) but no Decorative Finish Required

- 3 x Coats of polyamine/amide cured coal tar epoxy
- Dry film thickness = 3 x 140 μm = 420 μm

4) Non-immersed - Coastal Region (surface preparation ISO-Sa3)

- 1 x Coat of two component zinc epoxy primer
- 1 x Coat of two component epoxy intermediate
- 1 x Coat of polyurethane enamel (two part)
- Dry film thickness = 100 μm + 150 μm + 50 μm = 300 μm

5) Non-immersed - Moderate Inland Conditions (surface preparation ISO-Sa3)

- 1 x Coat of organic zinc silicate
- 1 x Coat of two component epoxy intermediate
- 1 x Coat of polyurethane enamel (two part)
- Dry film thickness = 75 μm + 75 μm + 40 μm = 190 μm

6) Hot-Dip Galvanized - (not passivate)

- 1 x Coat of epoxy primer
- 1 x Coat of polyurethane enamel (two part)
- Dry film thickness = 75 μm + 50 μm = 125 μm

7) Cast Iron Components (surface preparation ISO-Sa2½)

- 1 x Coat high epoxy primer
- 1 x Coat of polyurethane enamel (two part)
- Dry film thickness = 100 μm + 60 μm = 160 μm

MS9.4 Trade Names of Acceptable Products

COATING APPLIED	PRODUCT TRADE NAME
1. Hot-Dip Galvanizing	Must submit certified compliance with SANS 121
2. Powder Coating	Plascon epoxy/polyester powder : CEP series, Sigmalining FBE 27.
3. Universal Undercoat	Sigmarine 40, Carboline GP-64 Undercoat, Plascon Plasconamel 189 Undercoat.
4. High-Gloss Alkyd Enamel	Carboline AD-51 Finish, Plasconamel 1000 Finish, Sigmarine 49.
5. HB Epoxy Primer: Two Part	Plascon Plascotuff HB Epoxy MLE series, Sigmazinc 109HS, Carboline 193 Primer.
6. Epoxy Primer: Two Part (for hot dip galvanized surfaces)	International Interguard 269, Sigmacover 280.
7. Polyamine/Amide Cured Epoxy sealer/coating - two part	Carboline Rustbond Penetrating Sealer, Plascon Plascoguard Copon EA3 Primer, Sigmacover 522.
8. Epoxy Intermediate coat	Sigmacover 456, Carboline 190 HB, Plascon Plascosafe 18 Primer, Sigmacover 435.
9. Low Solvent, High Solids, Polyamine/Amide Cured Epoxy - two part	Plascon Plascoguard Copon KSIR88, Sigmaguard 720 Ameron Amercoat 385, Carboline 891.
10. Polyamine/Amide Cured Coal Tar Epoxy - two part	Sigmacover 300, Carbomastic 200, Ameron Amercoat 78HBB.
11. Zinc Phosphate Primer	Carboline GP-18 Primer, Plascon Plascoprime 183 HB, Bildphos M10 Primer.
12. Inorganic Zinc Silicate	Plascon Plascozinc 233, Sigmazinc 160, Carboline Carbozinc 11, Ameron Dimetcote 11.
13. Polyurethane Enamel - two part	Sigmadur 550, Carboline 134 over polyamine/mide coatings, Carboline 133 HB over zinc coatings, International Interthane 990, Plascon Plascothane Recoatable Enamel CPC Series, for two-coat systems, Plascon Plascothane Recoatable Enamel CPQ Series, for single coat systems.

MS10 BOLTS, NUTS, WASHERS AND OTHER FASTENERS

MS10.1 Materials

4) M12 & smaller

- All 316 stainless steel

5) Larger than M12

- In corrosive environment — 316 stainless steel
- In non-corrosive environment — 304 stainless steel or hot-dip galvanized if specified
- High tensile bolts & nuts — Hot-dip galvanized & painted

- Anchor fasteners 316 stainless steel

6) Washers

- Washers shall be of the same material as the associated bolt & nut

5) Anti-Seize Compound - Refer to **M_S4**

M_S10.1 Thread Projection

- Bolt thread projection outside of the nut shall be **≤ 6 mm**

M_S11 GRID FLOORING

- Glass fibre grid flooring may be used.
- On elevated walkways & stairs galvanized steel grid flooring is required
- Cut-outs in grid flooring shall be banded before hot-dip galvanizing protection is applied
- The depth of bearer bars shall not be less than 30 mm and the spacing not more than 40 mm c/c
- Panels shall be set in angle frames and tied down with the standard fasteners as supplied by the manufacturer. Fasteners shall be stainless steel 316

M_S12 BALUSTRADES & HANDRAILS

M_S12.1 Specifications & Requiring

- Safety aspects for Balustrades & Handrails shall comply with SANS 10104 (SABS 0104)
- Any balustrade or wall provided to protect a change in level shall comply with the requirements of SANS 10400-B
- A balustrade is required for a vertical change in level of ≥ 1 m
- The width of a stairway, measured from any wall or opposite balustrade, shall not be less than 750 mm
- A handrail with the height measured vertical from the pitch of the stairs shall be not less than 850 mm and not more than 1 m.
- Balustrades & Handrails Design Loading Requirements (SANS 10160-2-Table E)
  - Line Load (qk) = 1 Kn/m
  - Concentrated Load (Qk) = 1 Kn (applied over a 0.1 m x 0.1 m area)
- Balustrades & Handrails shall be manufactured from 3CR12 and painted
- The spacing for stanchions of balustrades of the hand and knee rail type shall be ≤ 1.8 m and no rail or stanchions shall have a diameter less than 32 mm
- The maximum opening between rails shall be 590 mm or such that it is not possible to pass a **solid 600 mm Ø ball** through the opening
- All railings in any occupancy classified as E2, E3, E4, H1 to H5 (SANS 10400-A) shall not have any opening above the pitch line that permits the passage of a **100 mm Ø solid ball**
- Welded balustrades & handrails are preferred
- Installations with jointed sections shall be secured without relative movement possible (***pop riveted fastening is not allowed***)
- Stanchions shall be horizontally or vertically base mounted with the minimum dimensions for the base 150 mm x 150 mm x t = 8 mm. The minimum fastener requirement is 2 x M16 stainless steel bolts & nuts (Anti-Seize compound - Refer to **M_S4**)

MS13 FIXED LADDERS

- All fixed ladders shall be manufactured from grade 316L stainless steel
- All anchor bolts (in concrete or brickwork) shall be 316 stainless steel
- Access points to fixed ladders shall be protected by a balustrade with opening gate
- Strings must preferable formed from flat bar
- The minimum width between strings is 400 mm with 450 mm the preferred width
- The vertical distance between ladder support brackets shall be ≤ 1700 mm
- Rungs (horizontal ladder supports as steps) shall be 25 mm Ø 316L stainless steel pipe to ASTM A312, class Sch40S, t = 3.38 mm welded to the string on the outside. **Each strung shall be machined with a checker** (like in rifles) **pattern in the centre 350 mm section of the strung or machined with an approved knurling pattern**.
- The inside of the stung shall be filled with an acrylic or silicone sealer to prevent any moisture accumulation inside the pipe
- The spacing between rungs shall be between 225 mm and 255 mm that leaves a minimum step gap of 200 mm and a maximum step gap of 230 mm
- There should be a clear space of ≥ 250 behind a rung
- The maximum height of a ladder should be kept to 6 m with the exception of reservoirs and chimneys
- **If the ladder height exceeds 4 m the ladder shall be fitted with a safety cage and the cage shall extend to 1 m above the top level**

MS14 PIPEWORK

MS14.1 Specifications for Pipework

✺ Specification for Steel Pipes

- Up to NB 150 shall comply with: SANS 62 - Class medium (marking blue band)
- Over NB 150 shall comply with: SANS 719 (general - class B - class 300W steel - except otherwise specified)
- Steel butt weld fittings shall comply with: ANSI B16.9 and BS 1640
- Steel pipework shall be hot-dip galvanized to SANS 121 and painted according to MS8.3-**6)**

✺ Specification for Stainless Steel Pipes

- NB 8 mm to 300 mm shall comply with: ASTM A312 Grade 316L Class Sch10S or Class Sch40S as specified - Dimensions to ANSI B36.19

✺ Specification for Hydraulic & Oil Pipes

- Hydraulic & Oil pipes shall comply with: BS 778

✺ Specification for Copper Pipes

- Copper pipes shall comply with: SANS 460 Class 2

✺ Specification for Polyethylene Pipes

- High Density Polyethylene Pipes (HDPE) shall comply with: SANS 553

MS14.2 Recommended Maximum Flow versus Velocity for Determining Pipe Diameter

(*Note: A minimum flow range is also applicable and will be determined by the liquid characteristics*)

FLOW RANGE Q (ℓ/s)	0 to 2.5	> 2.5 to 15	> 15 to 100	> 100 to 500
	VELOCITY RANGE (m/s)			
1) LIQUID (viscosity 0.7 to 1.4 mPa·s)				
♦ Grit Free	0.75 max	1.25 max	1.5 max	2 max
♦ Contains solids & grit		0.8 max (0.6 min)	1 max (0.65 min)	1 max (0.65 min)
2) STEAM	10 max	15 max	20 max	25 max
3) AIR & GAS				
♦ Above 10 kPa	5 max	8 max	10 max	25 max
♦ Below 10 kPa	2.5 max	3 max	4 max	5 max

MS14.2 Valve Orientation

- On sludge and sewage pipelines, check valves (non-return valves) & isolating valves, shall be mounted horizontally

MS14.3 Recommended Spacing for Pipe Supports for Steel & Stainless Steel Pipes

The maximum recommended spacing of supports is:

Pipe Diameter (mm) (NB)	Maximum Distance between Supports (mm)
Up to 15	800
20 to 50	1 500
65 to 100	2 500
125 to 200	3 500
250 to 500	5 000
Over 500	6 000 or as designed by professional structural engineer

MS14.4 Pipework on the Suction Side of a Pump

- Suction pipework shall be sized that the inlet velocity in the pipe coupled to the pump ≤ 1.5 m/s
- Flanged joints on suction pipework shall be kept to a minimum
- Gaskets used on flange joints on suction pipework shall preferably be rubber gaskets to BS 2494 with a 3 mm minimum thickness
- Horizontal inlet pipes to a pump shall be kept horizontal on the top and any pipe reducer shall be an **eccentric** reducer to keep the top of the pipe level with the inlet level at the pump. This configuration prevents air accumulation in high points in the inlet pipeline
- Stepped reducers shall be used if a diameter reduction of more than 50 mm/300 mm length is required

MS15 PIPE FLANGES & GASKETS

MS15.1 Pipe Flanges

- All standard flanges shall comply with SANS 1123 and BS 4504 if size of flange not specified in SANS 1123. The standard drill table shall be the pressure rating class/3 for flat face flanges. The minimum pressure rating class to be used is 1000
- NB: Some of the overseas equipment like pumps for instance comes with ANSI or other specified attached inlet and outlet pipe flanges. The suction pipe flange coupling to the pump must match the specific flange.

MS15.2 Gaskets

- The gaskets used between flange couplings shall be rubber to BS 2494 or compressed asbestos fibre to BS 1832 **and shall have a minimum thickness of 3 mm**.

Full face gaskets shall be used on SANS 1123 type /3 flanges and inner circle bolt gaskets shall be used on raised face flanges SANS 1123 type /4 flanges

MS16 VALVES

✺ Cast Iron Gate Valves with Resilient Seals

- The valves shall comply with SANS 664 or 665, minimum class 10
- The valves shall be flanged on both sides
- Valves shall have rising spindles unless otherwise allowed due to space restriction
- Spindles shall be 316 stainless steel and the hand wheels cast iron
- Application: raw sewage, raw water, treated effluent and water with a minimum of solids

✺ Cast Iron Gate Valves

- The valves shall comply with SANS 664 or 665, minimum class 10
- The valves shall be flanged on both sides
- Valves shall have rising spindles unless otherwise allowed due to space restriction
- Spindles shall be 316 stainless steel and the hand wheels cast iron
- Application: raw water, treated effluent and clear water

✺ Knife Gate Valves

- The valves shall comply with SANS 664 or 665, minimum class 10
- The valves shall be flanged on both sides
- Valves shall have rising spindles unless otherwise allowed due to space restriction
- Spindles shall be 316 stainless steel and the hand wheels cast iron
- Application: water sludge's, primary & secondary sedimentation tank sludge, waste activated sludge, digested sludge and raw sewage
- Valves shall have cast iron bodies, stainless steel blades (knife) and cast hand wheels. The valve shall have no carbon steel parts

✺ Check Valves

- The valves shall comply with SANS 1551-1 or otherwise specified, minimum class 10
- The valves shall be flanged on both sides
- At any sludge, raw sewage, sewage pump stations, sludge pump station or sewage treatment plant applications, check valves shall be of the single flap (door) type and no waver type shall be allowed. **Check valves in these applications shall be mounted horizontally**

- A shut-off valve shall be installed downstream of each check valve

M_S17 BASEPLATES

- Direct-coupled and belt-driven machines shall be mounted with the drive on cast iron or fabricated steel base plates
- Steel base plates shall be hot dip galvanized and painted
- Machined mounting pads shall be included for all fixing position. The pads shall be protected by a removable coating until installed
- No more than three (3) shims shall be used at a fixing position and the shims shall be stainless steel or other corrosion resistant metal
- Jacking screws shall be allowed: 2 diagonal for belt tensioning purposes and for horizontal alignment of electrical motors ≥ 10kW. Jacking screws shall be grade 316 stainless steel (nickel paste on tread)

M_S18 MOTOR DRIVEN GEARBOXES

- Unless otherwise stated, gearboxes shall be supplied with environmental protection to IP 55
- Unless otherwise stated, the gearboxes shall be directly mounted to the motor.
- The gears shall be helical gears which are used in applications with high speeds, large power transmission and low noise levels.
- Gear drives shall be sized to ensure that the running load peak does not exceed the endurance limits of the components.
- Gearboxes shall have an efficiency of not less than **96% on two stage reduction** and **95% on three stage reduction**
- Simple cooling may be by convection from the gearbox casings but without assistance from cooling fins or fans. Adequate other cooling means shall be provided as applicable
- The exterior of the gearbox shall be free from dust or moisture traps
- Access for inspection purposes shall be allowed for in the design of the gearbox casing
- Maintenance free oil lock seals on the high-speed shafts shall be a standard design feature.
- Eye bolts shall be provided for all reasonable lifting purposes
- The gearboxes shall conform to the relevant British Standards and AGMA ratings with respect to the following requirements:
  (a) The design ambient temperature shall be 45˚C.
  (b) The noise at 100% of the full output power and 45˚C ambient shall not exceed 86 dBA as measured 1 m in distance from the equipment.
  (c) The gearing shall give double the life of the bearings when subjected to similar loadings.

The design of the gearbox shall be such that the calculation of the actual radial load divided by the permissible radial load + the actual axial load divided by the permissible actual load shall be ≤ 1.

- A stainless-steel ball valve and extension drain pipe and plug shall be provided to facilitate oil changes by the maintenance staff. The termination of this drain shall be accessible from the operating platform.

✺ **Gearbox Housing**

- The gearbox shall be manufactured high strength cast iron which enables the gearbox to be used in harsh environments.
- A breather designed to prevent moisture from entering the housing of the gearbox, shall be fitted to each unit.
- Breather unit allowing continues oil spillage due to the overfilling of the gearbox shall not be accepted.
- Oil level sight glasses (fully protected and UV resistant) shall be provided with levels marked for running and filling minimum and maximum positions respectively. These shall be arranged for easy viewing and shall take into account the angle of mounting.

✺ **Gearbox Shaft**

- The impeller shall be secured to the shaft in such a way that it can be readily be removed without any damage without any damage to the impeller and the shaft.
- The shafts shall be protected by replaceable sleeves manufactured from non-corrosive material. The shaft shall be manufactured from grade 316 stainless steel.

✺ **Gears**

- The gears shall be high efficiency case hardened helical gears and rated in accordance with the AGMA Code of Practice 420.04 for continuous operation
- The gears shall be manufactured from high cast iron to BS 1542 Class 220 or an equivalent standard.

Semi-hardened and subsequently machined gears will not be accepted. Pinions shall be manufactured in accordance with AGMA 390.02 Class 12

✺ **Service Factor**

The service factors indicated in the table below shall be based upon the installed power:

Process Units	**Service Factor**
Rotating Bridges: Sedimentation & Clarifier Tanks	1.75
Aerators	2.5
Mixers	2.25
Centrifugal Pumps	2

✺ **Bearings**

- Roller bearings shall be used throughout.
- Taper roller bearings shall be used to sustain radial and thrust loads.
- Bearings shall be designed for a design life in excess of the indicated hours in the table below, in accordance with ISO.281.
- Bearings for the output shaft shall be designed to withstand bending, up thrust, down pull and radial loads imposed by the turbine.

✺ **Bearing Design Life**

Process Units	Design Life	Operation
Rotating Bridges: Sedimentation & Clarifier Tanks	L10 for 75 000	Continuous
Aerators	L10 for 100 000	Continuous
Mixers	L10 for 100 000	Continuous
Centrifugal Pumps	L10 for 100 000	Continuous

✺ **Lubrication**

- The gearboxes shall be constructed with a dry well for the low speed shaft bearing to avoid complete drainage of oil in the event of an oil seal failure. Provision to monitor the oil level must be provided. The bearing shall be grease lubricated with the greasing point easily accessible.
- A stainless steel ball valve and extension drain pipe and plug shall be provided to facilitate oil changes by the maintenance staff. The termination of this drain shall be accessible from the operating platform.

M_S19 GEARBOX / MOTOR COUPLING

- The coupling shall be fully rated to transmit the motor full load power and tested to prove static and dynamic balance.
- The coupling shall accommodate small axial, lateral and angular misalignments without imposing undue stresses on the shaft and bearings.
- The coupling shall be enclosed in a stationery solid-316L stainless steel plate guard

✺ **V-belt**

- V-belts shall be designed for the specific application and the high tension and high power drives, shall be long wearing, tough and trouble free.
- The V-belt cover shall be oil, heat and ozone resistant in order to protect the inner components.
- The compression section shall provide excellent gripping action and a high coefficient of friction, but shall also allow an initial start-up clutching action in order to eliminate power spikes and excessive bearing loading.
- The moulded cogs shall provide optimum flexibility with minimal build-up of heat.

✺ **Flexible Couplings**

- Couplings shall be properly aligned by means of a taper gauge or set of feeler gauges and a straight edge or dial indicator.
- Laser beam alignment is essential on large motors
- Two types of misalignments are encountered by flexible couplings:
- Angular misalignment and parallel misalignment. Any adjustment to correct the misalignment in one direction may affect the other direction and both the angular and parallel alignment shall be checked after each adjustment.

A periodic check of the coupling alignment shall be performed.

M_S20 CENTRIFUGAL PUMPS

- Centrifugal pumps shall preferably with single stage impellers, end suction, back pull-out type, direct coupled to the drive motor with applicable type coupling, complete with standardized baseplate and coupling guard
- Preference **shall be given to pumps with an operating speed ≤ 1500 rpm** (4-pole or 6-pole electrical motors
- For low volumes clear water pressure boosting and pumping, the vertical mount, multi-stage impeller configuration, maybe used
- When selecting a pump performance curve/pump for multi pumps in parallel and friction loss in the pump line forming a large part of the total head, a clear indication shall be given on the pump performance curve of the minimum & maximum head range for safe operation of the pump
- The electrical drive motor for a specific pump shall be continuously rated to provide the following margins in access of the required pump input power:

1) 10% above the maximum power demand under any condition of operation for the pump, including the minimum head discharge point (to the open at the pump outlet)

2) 20% above the selected duty point for the specific pump

- Impeller design

1) Impeller maximum diameter ≤ 95% of volute or diffuser

2) Impeller surface finish up to grade N7

- The vibration severity of the unit during operation shall not exceed $\mathbf{V_{RMS}}$ = 1 mm/s at the pump and motor bearings
- Impeller shaft shall be stainless steel grade 316
- Pump shaft seals shall be a pump sleeve, stainless steel grade 316 with a mechanical seal
- A vent cock shall be fitted to the highest part of the casing

M_S21 SUBMERSIBLE PUMPS

- Preference **shall be given to pumps with an operating speed ≤ 1500 rpm** (4-pole or 6-pole electrical motors
- The electrical drive motor for a specific pump shall be continuously rated to provide the following margin in access of the required pump input power:

1) 15% above the maximum power demand under any condition of operation for the pump, including the minimum head discharge point (to the open at the pump outlet)

- Impeller design applicable to sewage and sludge applications

1) The impeller shall be non-clogging for application in the waste water field

2) The impeller with associated pipework to handle solids with a diameter of ≥ 80 mm

3) Impeller configuration shall include cutter edges for cutting stringy material if required to prevent the clogging and strangle effect on the impeller

4) The operating conditions of impellers shall be rated, abrasive. Low rotating speed impellers is thus essential

- The motor shall be close coupled to the pump and separated from the pump casing by an oil chamber

- The shaft, all fasteners and all external steel components in contact with liquid shall be stainless steel grade 316
- The pump & motor casing shall be coated by a heavy duty polyurethane or epoxy coating with a minimum of thickness of 400 μm

M_S27 LIFTING EQUIPMENT

- **General Requirements**

- Lifting equipment shall comply with the following general requirements:
- The design, fabrication and installation of lifting equipment shall be fully in accordance with the relevant aspects of the Occupational Health and Safety Act and Regulations
- Lifting equipment shall be designed, constructed and installed in accordance with an internationally accepted technical design standard

The guidelines given in the Southern African Steel Construction Handbook may be used where applicable and where these do not conflict with the internationally accepted technical design standard

- Test certificates shall be provided for all items of lifting equipment.
- The safe working load (SWL) shall be permanently marked on all items of lifting equipment.

- Lifting equipment and installations shall be inspected and shall be tested over the complete lifting range using a test load.

Unless otherwise specified in the internationally accepted technical design standard, the test load shall be:
at least 125 % of the SWL for equipment with a SWL of up to 10 tonne SWL
at least 110 % of the SWL for equipment with a SWL of 10 tonne and above

- High-tensile and alloy steel chains shall have a factor of safety of at least four. Other chains shall have a factor of safety of at least five.
- Steel-wire ropes shall have a factor of safety of at least six (6). Man-made fibre ropes or woven webbing shall have a factor of safety of at least six (6). Natural fibre ropes shall have a factor of safety of at least ten (10).
- Anchor fasteners for securing steel structures to concrete shall have a diameter of not less than M16 and shall be of grade 316 SS
- Foot-plates for columns which form part of lifting gantries shall be secured with a minimum of four anchor bolts.
- Hollow steel sections such as pipes and tubing are not acceptable as structural members unless the section is fully closed by welding.
- Tenderers shall note that many aspects, such as fabrication, welding, corrosion protection and fasteners, shall be in accordance with the requirements of other clauses in this Standard Specification for Mechanical Works (including General Works)
- Steel Gantries

In addition to the general requirements for lifting equipment, steel gantries shall comply with the following:

- The same internationally accepted technical design standard used for the design of the crawl beam or crane shall be used for designing the gantry which supports the crane or crawl beam.

- Columns shall be cross-braced and/or “triangulated” in more than one plane. In other words, columns shall not be cantilevered in any vertical plane
- Gantry steelwork shall be hot-dip galvanised and painted
- Hoists

In addition to the general requirements for lifting equipment, hoists shall comply with the following:

- Hoists shall be provided with an overload prevention device; e.g. a clutch which slips upon overloading. Powered hoists shall comply in all applicable respects with Driven Machinery Regulation 18 of the Occupational Health and Safety Act.
- Powered hoists shall hold the load stationary upon power failure.
- The bottom hook shall swivel on a ball or roller bearing through 360º and the bearing shall have a protective skirt. The hook shall be fitted with a safety latch.
- Lifting chain is preferred, but corrosion-protected steel wire rope is acceptable.
- Chain boxes shall be provided for holding unloaded lengths of lifting chain.

M_p -MECHANICAL WORKS

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PART MP: PARTICULAR SPECIFICATIONS - MECHANICAL

MP1 GENERAL

In the specifications, duties and products (or similar products) are specified to obtain the best quality products for the works. The Tenderer is however not restricted to any product specified and must check and offer products with a quality that complies with the SANS standards and of which the Tenderer can submit proof of quality & durability. Some Tenderers are well known for their in-house developed products and the Engineer will recommend any such product with a well-known history and reliability.

The Tenderer must verify all given duties for compatibility with a certain product offered. Should the Tenderer offer a product that differs from the flows and duties specified he must clearly indicate this in his offer that the Engineer can adjust the process parameters or to reject the specific product offered. Certain products from well-known manufacturers with a proven track record will definitely get preference over inferior, unproven or not to standard products.

MP2 SCOPE OF WORK

This section provides a summary of the mechanical items required for this contract. More detailed description of items and specifications are provided in the individual item sections in the document.

MP2.1 Inlet Works

- 1 x Course hand rake screen, 304L stainless steel, with 30 mm openings between bars & 400 mm wide perforated drip plate.
- 1 x Fine hand rake screen, 304L stainless steel, with 6 mm mm openings between bars & 400 mm wide perforated drip plate.
- Prefabricated Venturi flume
- An open canal Ultra-sonic level detector with flow data transmitter
- Stainless steel grit canal draining pipework
- Submersible pumps.
- De-Grit removal pumps

MP2.2 Equalization basin

- Bell mouth flow through pipe arrangement - stainless steel
- Stainless steel ring pipe with nozzles for wash down
- Valve with electrical actuator for manually or automatically remote opening & closing
- Aeration pipe work as per detail

MP2.3 Aerobic (Fine Bubble aerator) Reactor

- Outlet flow control weir
- Converted existing structure converted
- Stainless steel outlet flow baffle plate
- 3CR12 (painted) access stairway & hand railing for each concrete bridge
- New aeration pipework disk fine bubble diffusers

MP2.4 Anaerobic Reactor

- Outlet flow control weir

- Converted existing structure converted
- Stainless steel outlet flow baffle plate
- 3CR12 (painted) access stairway & hand railing for each concrete bridge

M_P2.5 Sludge Re-circulation Pump Station

- 2 x Self-priming sludge re-circulation pumps complete with electrical motor and base plate frame (RAS pumps - s-recirculation)
- 2 x 316L Stainless steel suction pipework with supports, valves & gauges
- 32x 316L Stainless steel outlet pipework (up to 3 m outside PS) with supports, valves & gauges

M_P2.5.1 Emergency Pump Station

- 2 x Self-priming sludge re-circulation pumps complete with electrical motor and base plate frame (RAS pumps - s-recirculation)
- 2 x 316L Stainless steel suction pipework with supports, valves & gauges
- 32x 316L Stainless steel outlet pipework (up to 3 m outside PS) with supports, valves & gauges

M_P2.6 Chlorine Dosing Building & Chlorine Contact Canal

- Chlorine room 2 - Correctly rated vertical shaft multi-stage ejector booster pump
- Chlorine room 2 - Mounted aspirator type injector to produce the vacuum to draw the gas from the chlorine cylinder
- Chlorine room 1 - Vacuum demand valve, mounted to chlorine gas cylinder
- Chlorine room 1 - A Chlorine gas flow meter (Rota-meter) with calibrated flow measurement indication marking in a tube arrangement.
- Heater(s) for warming chlorine gas (to be confirmed)
- Safety equipment:
  - Approved chlorine wall charts
  - First aid cabinet
  - Full face piece self-containing breathing apparatus
  - Gas leak detector
  - Outside of building emergency water spray tap (foot operated) for face and hand washing
- Automatic chlorine dosing start-up or shut down from treated effluent flow detection switch

M_P2.7 Sludge drying beds

- Submersible filtered water re-circulation pump with automatic start & stop level control
- Provisional - “Bob-Cat” front end loader

M_P2.8 Electrical Switchgear Building

- Standby generator as describe in Electrical Specification

M_P2.9 Electrical work:

- Part E of the Specification

M_P3 REFERENCE TO PRODUCT BRANDS

Please refer to **M_S4** in the Standard Specification

MP4 REFERENCE TO STANDARDS & ABBREVIATIONS USED

MP4.1 Abbreviations

✺ **Process Design**

- AADDWF : Annual Average Daily Dry Weather Flow
- AADWWF : Annual Average Daily Wet Weather Flow
- AADPF : Annual Average Daily Peak Flow
- BNR : Biological Nutrient Removal
- MLSS : Mixed Liquor Suspended Solids
- RAS : Return Activated Sludge
- (s)-recycle : Sludge Recycle
- (a)-recycle : MLSS Recycle

✺ **STANDARDS Institutes**

- AFBMA : Anti-Friction Bearing Manufacturer's Association
- AGMA : American Gear Manufacturer's Association
- AISI : American Iron and Steel Institute
- ANSI : American National Standards Institute
- ASTM : American Society for Testing and Materials
- ASME : American Society of Mechanical Engineers
- AWS : American Welding Society
- BS : British Standards Institution
- NEMA : National Electrical Manufacturer's Association
- SANS : South African National Standards
- SIS : Swedish Institute of Standards
- DIN : Deutsch Industry Norman
- ISO : International Organization for Standards
- SAECC : South African Electrolytic Corrosion Committee

MP4.2 Applicable STANDARDS

SANS 10400 : National Building Regulations

BS 5304 : Code of Practice for Safeguarding of Machinery

SANS 9096 - 1 : Testing of Welders (where applicable)

BS 292 Part 1 : Dimensions of Ball Bearings, cylindrical & Spherical Roller Bearings

SANS 10162 - 4: Structural use of Steel Part 4: Design of Cold Form SS structural

SANS 10044 - 3: Welding Part 3: The Fusion of Steel (& SS): Test for Welding Procedures

SANS 10044 - 4: Welding Part 4: The Fusion of Steel (& austenitic SS): Test for the Approval of Welders where working without Procedure Approval Requirements

SANS 10064	:	The Preparation of Steel Surfaces for Painting
SANS 10104	:	Hand Railings & Balustrading - (Safety)
SANS 10341	:	Installation & Maintenance of bearings - General Guidelines
SANS 1700 - 5 - 9	:	Fasteners Part 5: General Requirements & Material Properties Section 8: Corrosion Resistant SS Fasteners - Bolts, Screws & Studs
SANS 1700 - 5 - 10	:	Fasteners Part 5: General Requirements & Material Properties Section 8: Corrosion Resistant SS Fasteners - Bolts, Screws & Studs
ISO 281	:	Rolling Bearings - Dynamic Load Ratings and Rating Life
BS EN 10139	:	Carbon Steel, Plate & Strip
BS EN 1564	:	Austempered Ductile Cast Iron
BS EN 13835	:	Austenitic Cast Iron
BS EN 10088-1	:	304 Stainless Steel
BS EN 10088-1	:	316 Stainless Steel
BS EN 10028-2	:	4130 Heat Treated Alloy Steel
BS EN 10028-2	:	4140 Heat Treated Alloy Steel
BS 970: Part 3 805M20	:	8620 Case Hardening Alloy Steel
BS EN 1982	:	Leaded Bronze CC493K

All material hardness's measured to Rockwell C (HRC)

M_P5 DETAILED SPECIFICATION

$M_P5.1$ Inlet Works

.1 Hand Rake Screen

✺ **Description**

- A inclined hand rake screen shall be installed in the inlet canal with a 400 mm wide drip plate for dewatering
- The screen shall comprise a series of parallel bars installed at an angle of 45° to the horizontal
- The openings between bars shall be 30 mm and the face of any bar in the upstream side shall be 8 mm thick and taper to 6 mm at the downstream side
- The depth of the bars shall be 40 mm minimum
- A 50 mm drop in the floor just before the lower attachment bar and mounting plate shall allow that the lower cross bar do not protrude above the floor level
- The top of a screen bar shall be bend to run horizontal and the cross carrier bar with side mounting plates shall be installed just after the bends to allow for raking of the screenings onto a perforated drip plate.
- The width of the inlet canal is 350 mm where the hand rake screen is to be installed and the canal depth 950 mm
- The screen is installed at this stage taking into account that gravitational flow to the plant is foreseen

in the near future

- Two custom made hand rakes shall be supplied with the screen

✺ **Materials**

- The hand rake screen shall be manufactured from 304L stainless steel
- All mounting bolts shall be 304 stainless steel and nickel paste shall be apply to all bolts before the nut is screwed in
- The drip plate shall be manufactured from 316L stainless steel
- The hand rakes shall be manufactured from 304L stainless steel

.2 FLOW MEASURING EQUIPMENT

✺ **Equipment Description**

An open canal ultrasonic level detector (4 to 20 mA) shall be installed over a side canal box before the venturi-flume with 304 stainless steel holding bracket. The side canal box floor level is ± 100 mm below canal floor level to calibrate the detector for zero flow. The ultrasonic sensor shall be coupled to a flow meter transmitter with 3 x 4A NO/NC potential free contacts.

A data logger with a 4 – 20 mA input and RS 232 interface and minimum 16000 measured valves storage capacity shall be installed in the motor control board. The data shall be downloaded to a PC in the control room office for printing and record keeping. The flow measuring equipment shall be from a single manufacturer and Endress & Hauser equipment or similar is preferred.

.3 Venturi Flume

✺ **Supply**

The tenderer shall supply the civil contractor with a pre-fabricated class fibre venturi-flume (Autento or similar) with **A= 300 mm & b = 150 mm**. The flume indicated on the drawings is a non-standard flume size. The manufacturer shall supply the flow/depth curve to the tenderer to use for calibrating the flow measuring equipment. The liquid flow in the flume shall comply with BS 3680: Part 4 Weirs and Flumes. The Engineer to verify the flow/depth curve for the venturi flume offered.

.4 De-Grit Pumps

1) Pump Description

Two (2) submersible de-gritter pumps, P1 and P2, shall be supplied, installed, tested and commissioned in a duty/standby arrangement for grit removal from the vortex de-gritters. Each pump shall be a Tsurumi HSD type, or similar approved, complete with an agitator and tungsten-chromium impeller, and suitable for pumping abrasive, grit-laden wastewater.

.2) Pump Duties

Each pump shall deliver 2 L/s at 4 m total head. The approximate motor rating shall be 0.55 kW per pump, subject to the manufacturer’s confirmation that the motor is correctly sized for the specified duty and the applicable requirements of MS21.

.3) Tenderer Information

The Tenderer shall submit manufacturer's literature, motor details and a certified pump performance curve confirming the specified duty and suitability for grit-handling service.

.5 . Immersible recycle pumps

1) Pump Description

Two (2) immersible recycle pumps, P3 and P4, shall be supplied, installed, tested and commissioned in a duty/standby arrangement. Each pump shall be a Hidrostal immersible type, or similar approved, and suitable for the specified recycle service.

.2) Pump Duties

Each pump shall deliver 3 L/s at 3.5 m total head. The approximate motor rating shall be 0.75 kW per pump, subject to the manufacturer's confirmation that the motor is correctly sized for the specified duty.

.3) Tenderer Information

The Tenderer shall submit manufacturer's literature, motor details and a certified pump performance curve confirming the specified duty and suitability for the service.

MP5.2 **EQUALIZATION BASIN(coarse bubble aerator)**

✺ **Equipment Description**

- Inflow = 0 ℓ/s to 3 ℓ/s
- Outflow = ± 2 ℓ/s
- Bell mouth outlet, 180 mm Ø built in
- 50 mm 304L Sch 40 stainless steel pipe ring with stainless steel nozzles and electrical actuator on 50 mm gate valve for remote closing and opening

MP5.7 **SLUDGE RECIRCULATION PUMPS**

.1) Pump Description

- Two (2) self-priming centrifugal pumps, complete with motors, mounting frames and fixing bolts are to be supplied, installed, tested & commissioned for the settled sludge recirculation pumpstation. A Cornell or Gorman Rupp self-priming pump (or other similar specification pump) may be offered.
  The pumps shall be of the horizontal self-priming centrifugal solids handling type.
  The pumps shall be of standard dimensions, built to limit gauges or formed to templates, such that parts will be interchangeable between like units.

.2) Pump Duties

- Pump delivery (average sludge level in sump) = 9 ℓ/s
- Pump plinth top level = 20m

.3) National & International Institute Standards

- Please refer to MP4

.4) Suction and Outlet Pipework

The Contractor shall supply a layout and BoQ of the proposed pipework to fit the pumps offered. **All suction pipework shall be grade 304L stainless steel Sch 10.** A preliminary layout of the pipework is shown on Draw.

.5) Information Required from the Tenderer

- Manufacturer's literature, illustrations and applicable data for the pump, including total weight of the equipment and the weight of the single largest item.
- Manufacturer's certified curves illustrating pump characteristics of head, discharge, brake horsepower and efficiency. Curves shall be plotted from no flow at shut off head to maximum pump runout head and flow allowed by the manufacturer. Points of operation which cause bearing stress or shaft deflection in excess of the manufacturer's tolerances for continuous operation shall be indicated on the submitted curves.
- Materials used in pump construction, details on all pump accessories, and dimensions of major components.
- A list of manufacturer's recommended spare parts to be supplied, with the manufacturer's current price for each item. Include O-rings, seals, etc. on the list.
- List bearings by the bearing manufacturer's name and numbers.
- Pumping equipment requiring special tools for maintenance shall be provided with one set of tools labeled, packed with instruction for use, and housed in a metal tool box with lock-end hoop for each two units provided.
- The following data shall be provided on the drive motors:
  rpm at full load, frequency, voltage, full load current, code and design letter, efficiency, horsepower, number of phases, temperature rise, service factor and bearing life rating.

.6) Operating and Maintenance Instructions

For all pumps furnished under this Section, the Contractor shall submit operation and maintenance manuals. Operating and Maintenance Data to include, at a minimum, the following:

.6.1) Equipment function

.6.2) Description

.6.3) Normal and limiting operating characteristics

.6.4) Installation instructions (assembly, alignment and adjustment procedures)

.6.5) Operation instructions (normal startup and shutdown procedures.

.6.6) Normal operating conditions and emergency situations)

.6.7) Lubrication and maintenance instructions.

.6.8) Troubleshooting guide.

.6.9) Parts list and predicted life of parts subject to wear.

.6.10) Drawings – cross sectional view, assembly and wiring diagrams.

.6.11) Performance curves.

.7) Start-up Supervision

- A factory representative of the pump manufacturer, who has complete knowledge of proper operation and maintenance, shall be provided for two (2) days to instruct representatives of the Owner and the

Engineer on proper operation and maintenance. With the permission of the Owner, this work may be conducted in conjunction with the inspection of the installation and test run. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

.8) Product delivery, storage and handling

- All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is complete and the units and equipment are ready for operation.
- All equipment and parts must be properly protected against any damage during a prolonged period at the site.
- Finished surfaces of all exposed pump openings shall be protected by wooden planks, strongly built and security bolted thereto.

.10) Warranty

- The contractor shall furnish to the Owner a minimum five year warranty on the proposed pump system.

  The warranty shall cover repair or replacement of parts resulting from faulty or improper assembly or erection, or defective workmanship or materials.

  The warranty period shall commence on the date of shipment.

.11) Pump Construction

- Consideration shall be given to the intended service, in which occasionally debris will lodge between the pump suction check valve and seat. The result is not only in loss of the suction leg, but also in the siphoning of the liquid from the pump casing to the approximate centerline of the impeller. Such occurrence shall be considered normal with proper installation of an air release line free to atmosphere.

  In consideration of such occurrence and of the unattended operation anticipated, each pump shall be designed as to retain adequate liquid in the pump casing to insure unattended automatic re-priming while operating at its rated speed in a completely open system without suction check valves and with a dry suction leg.

  Openings and passages of the pump shall be large enough to permit the passage of a sphere 63mm. Pump volute or casing shall contain no openings, such as recirculation ports, of a lesser diameter than sphere sizes specified. Screens or any internal devices that create a maintenance nuisance or interfere with priming and performance of the pump shall not be permitted.

.12) Pump Casings

The pump casings shall be constructed of close-grained ductile iron, ASTM-A536 of sufficient thickness to withstand all stresses and strains of service at full operating pressure.

The internal casing shall be a modified concentric volute design to reduce the radial loads below 3.33KN at any point on the pump curve, including shut off.

Suction and discharge connections shall be 125 lb. DIN Standard flat-face flanges positioned as indicated on the drawings.

.13) Cover Plate

Pump must be equipped with a removable ductile iron, ASTM-A536 cover plate of sufficient size to allow complete access to pump interior to permit the clearance of stoppages and to provide ample access for service and repairs without disturbing suction or discharge piping.

Cover plate shall be minimal in weight to insure easy removal and replacement, by a single maintenance person.

Under no circumstances shall the pumps pressure relief valve be installed on the cover plate, these are to be fitted to the side of the pump casing out of harm's way.

.14) Wear Plate and Rotating Assembly

Pump shall be fitted with a ductile iron, ASTM-A536 replaceable wear plate. Replacement of the wear plate, impeller, seal and suction check valve shall be accomplished through the removable cover plate or through specially designed rear pullout. The pump wear plate shall be adjustable from the outside of the pump through the provided adjustment screws to restore impeller vane clearances. Pumps without this feature will not be considered acceptable.

The entire rotating assembly, which includes bearings, shaft, seal and impeller, shall be removable as a unit without disturbing the pump volute or piping.

.15) Suction Check Valve

Pump shall incorporate a one-piece suction check valve with neoprene flap valve assembly that can be removed or installed through the removable cover plate opening, without disturbing the suction piping.

The suction check valve shall be clamped in a ductile iron positive mounting clamp, and be bolted from the exterior of the pump case to retain the rubber check valve. The clamp shall be rigidly held into place inside the pump case in a manner that shall eliminate wear between the check valve and the pump case.

Pumps utilizing a hinge pin without special replaceable wear bushings shall not be acceptable.

The sole function of check valve shall be to eliminate re-priming with each cycle. Pumps requiring separate suction check valves to prime or re-prime will not be acceptable.

Re-prime – The pump must be able to re-prime without the check valve installed.

.16) Impeller

Pump impeller shall be of the two (2) vane semi-open, non-clog type of close-grained ductile iron, ASTM-A536 with integral back vanes, threaded to the pump shaft and secured with a stainless steel impeller washer and bolt.

Impeller shall be mechanically secured to the pump shaft by a steel key or other device approved by the Engineer.

Pump shall be provided with a means for externally adjusting the clearance between the impeller and the wear plate.

.17) Seal

The back plate and stuffing box shall be of close-grained ductile iron, ASTM-A536 and bolted to the casing. The cavity in the cover shall be an open dished design with deflector vanes to positively remove build-up of material / gas / air pockets from the seal faces and spring through a cyclonic

action “CYCLO-SEAL” to extend the life of the seal. Shaft sealing shall by means of a single mechanical John Crane Type 2 shaft seal with tungsten carbide / silicon carbide seating and mating rings, 316 stainless steel constructions. The design shall allow for continuous operation without the need for external flush water or venting. Double seals or cartridge seal with water flush are not acceptable.

Mechanical seal shall be lubricated from an independent oil filled reservoir. A clear sight gauge will be fitted to provide easy monitoring of the seal oil level and condition without removing any screws. A vent system will be in place in case of overfilling or pressure. An atmospheric vent between the mechanical seal chamber and the bearing chamber shall form part of the pump protection.

Each mated seal surface shall be lapped to insure that the seal faces are in full contact at all times. The seal seat must be self-aligning during periods of shock load that will cause deflection, vibration and axial or radial movement of the pump shaft.

Pumps shall be provided with oil lubricated seals which shall be lubricated with oil contained in a separate oil-filled reservoir.

.18) Shaft Bearing

The shaft bearing shall be of ample size and proper design to withstand all radial and thrust loads incurred during normal pump operation. Bearings shall be oil lubricated, with the bearing pedestal cooled by pumped liquid. The steel alloy pump shaft shall be protected by a steel alloy Brinell 313, shaft sleeve through the mechanical seal cavity. The pump shaft shall be sealed against leakage by a balanced mechanical seal. Both the stationary sealing member and mated rotating member shall be of Silicon Carbide.

.19) Shaft

The shaft shall be constructed of ANSI1144 stress proof alloy steel. The shaft shall be accurately machined and polished and of sufficient size to transmit full driver output without excessive flexure or stressing. Shaft deflections shall not exceed 0.1524 mm measured at end of shaft when operating at the specified design.

.20) Coupling Guards

Pump coupling shall be enclosed in a guard constructed of any one, or combination of materials consisting of expanded, perforated or solid sheet metal.

.21) Pump and Motor Base

The unit base shall be fabricated of commercial grade steel of adequate thickness to prevent flexing or warping under operating conditions.

All seams shall be made with continuous bead welds.

The unit base shall be flanged and drilled on opposite sides to which mounting studs or bolts may be attached for securing the base to the pad.

Pump motor base shall be constructed so as to permit motors to be moved to adjust tension of drive bolts.

✺ **Quality management**

- A quality management plan shall be submitted for the design, manufacturer, installation and commissioning of the pumps, for approval by the Client’s representative on site

- **Testing**

a) **Before commissioning**

☑ Refer to Standard Specification

☑ **If requested a pump test at the manufacturer/supplier pump test facility to be witnessed by the Client's Representative on site**

☑ Test for correct rotation of motors

☑ Test for correct operation of control gear

☑ Test for correct alignment of shafts, belts & pulleys

☑ Submit all certificates required

☑ Submit all operation & maintenance manuals

b) **Commissioning**

☑ If the equipment meets the duty requirements

☑ Any other performance tests as specified

☑ Where a power test is required, the power absorbed by each motor at duty point does not exceed the values stated in the technical data sheets by more than 5%

☑ Where a vibration test is required, the vibration measured at each point does not exceed the level prescribed in BS 4675 Part 1 for the appropriate class of machine

c) **After commissioning**

☑ Monitor and record all data & performance for the specified test & trail period

MP5.7.1 SLUDGE RECIRCULATION PUMPS(RAS)

.1) Pump Description

- Two (2) self-priming centrifugal pumps, complete with motors, mounting frames and fixing bolts are to be supplied, installed, tested & commissioned for the settled sludge recirculation pumpstation. A Cornell or Gorman Rupp self-priming pump (or other similar specification pump) may be offered.
  The pumps shall be of the horizontal self-priming centrifugal solids handling type.
  The pumps shall be of standard dimensions, built to limit gauges or formed to templates, such that parts will be interchangeable between like units.

.2) Pump Duties

- Pump delivery (average sludge level in sump) = 9 ℓ/s
- Pump plinth top level = 15m

.3) National & International Institute Standards

- Please refer to MP4

.4) Suction and Outlet Pipework

The Contractor shall supply a layout and BoQ of the proposed pipework to fit the pumps offered. **All suction pipework shall be grade 304L stainless steel Sch 10.** A preliminary layout of the pipework is shown on Draw.

.5) Information Required from the Tenderer

- Manufacturer's literature, illustrations and applicable data for the pump, including total weight of the equipment and the weight of the single largest item.
- Manufacturer's certified curves illustrating pump characteristics of head, discharge, brake horsepower and efficiency. Curves shall be plotted from no flow at shut off head to maximum pump runout head and flow allowed by the manufacturer. Points of operation which cause bearing stress or shaft deflection in excess of the manufacturer's tolerances for continuous operation shall be indicated on the submitted curves.
- Materials used in pump construction, details on all pump accessories, and dimensions of major components.
- A list of manufacturer's recommended spare parts to be supplied, with the manufacturer's current price for each item. Include O-rings, seals, etc. on the list.
- List bearings by the bearing manufacturer's name and numbers.
- Pumping equipment requiring special tools for maintenance shall be provided with one set of tools labeled, packed with instruction for use, and housed in a metal tool box with lock-end hoop for each two units provided.
- The following data shall be provided on the drive motors:
  rpm at full load, frequency, voltage, full load current, code and design letter, efficiency, horsepower, number of phases, temperature rise, service factor and bearing life rating.

.6) Operating and Maintenance Instructions

For all pumps furnished under this Section, the Contractor shall submit operation and maintenance manuals. Operating and Maintenance Data to include, at a minimum, the following:

.6.1) Equipment function

.6.2) Description

.6.3) Normal and limiting operating characteristics

.6.4) Installation instructions (assembly, alignment and adjustment procedures)

.6.5) Operation instructions (normal startup and shutdown procedures.

.6.6) Normal operating conditions and emergency situations)

.6.7) Lubrication and maintenance instructions.

.6.8) Troubleshooting guide.

.6.9) Parts list and predicted life of parts subject to wear.

.6.10) Drawings – cross sectional view, assembly and wiring diagrams.

.6.11) Performance curves.

.7) Start-up Supervision

- A factory representative of the pump manufacturer, who has complete knowledge of proper operation and maintenance, shall be provided for two (2) days to instruct representatives of the Owner and the Engineer on proper operation and maintenance. With the permission of the Owner, this work may be conducted in conjunction with the inspection of the installation and test run. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

.8) Product delivery, storage and handling

- All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is complete and the units and equipment are ready for operation.
- All equipment and parts must be properly protected against any damage during a prolonged period at the site.
- Finished surfaces of all exposed pump openings shall be protected by wooden planks, strongly built and security bolted thereto.

.10) Warranty

- The contractor shall furnish to the Owner a minimum five year warranty on the proposed pump system.

  The warranty shall cover repair or replacement of parts resulting from faulty or improper assembly or erection, or defective workmanship or materials.

  The warranty period shall commence on the date of shipment.

.11) Pump Construction

- Consideration shall be given to the intended service, in which occasionally debris will lodge between the pump suction check valve and seat. The result is not only in loss of the suction leg, but also in the siphoning of the liquid from the pump casing to the approximate centerline of the impeller. Such occurrence shall be considered normal with proper installation of an air release line free to atmosphere.

  In consideration of such occurrence and of the unattended operation anticipated, each pump shall be designed as to retain adequate liquid in the pump casing to insure unattended automatic re-priming while operating at its rated speed in a completely open system without suction check valves and with a dry suction leg.

  Openings and passages of the pump shall be large enough to permit the passage of a sphere 63mm. Pump volute or casing shall contain no openings, such as recirculation ports, of a lesser diameter than sphere sizes specified. Screens or any internal devices that create a maintenance nuisance or interfere with priming and performance of the pump shall not be permitted.

.12) Pump Casings

The pump casings shall be constructed of close-grained ductile iron, ASTM-A536 of sufficient thickness to withstand all stresses and strains of service at full operating pressure.

The internal casing shall be a modified concentric volute design to reduce the radial loads below 3.33KN at any point on the pump curve, including shut off.

Suction and discharge connections shall be 125 lb. DIN Standard flat-face flanges positioned as indicated on the drawings.

.13) Cover Plate

Pump must be equipped with a removable ductile iron, ASTM-A536 cover plate of sufficient size to allow complete access to pump interior to permit the clearance of stoppages and to provide ample access for service and repairs without disturbing suction or discharge piping.

Cover plate shall be minimal in weight to insure easy removal and replacement, by a single

maintenance person.

Under no circumstances shall the pumps pressure relief valve be installed on the cover plate, these are to be fitted to the side of the pump casing out of harm's way.

.14) Wear Plate and Rotating Assembly

Pump shall be fitted with a ductile iron, ASTM-A536 replaceable wear plate. Replacement of the wear plate, impeller, seal and suction check valve shall be accomplished through the removable cover plate or through specially designed rear pullout. The pump wear plate shall be adjustable from the outside of the pump through the provided adjustment screws to restore impeller vane clearances. Pumps without this feature will not be considered acceptable.

The entire rotating assembly, which includes bearings, shaft, seal and impeller, shall be removable as a unit without disturbing the pump volute or piping.

.15) Suction Check Valve

Pump shall incorporate a one-piece suction check valve with neoprene flap valve assembly that can be removed or installed through the removable cover plate opening, without disturbing the suction piping.

The suction check valve shall be clamped in a ductile iron positive mounting clamp, and be bolted from the exterior of the pump case to retain the rubber check valve. The clamp shall be rigidly held into place inside the pump case in a manner that shall eliminate wear between the check valve and the pump case.

Pumps utilizing a hinge pin without special replaceable wear bushings shall not be acceptable.

The sole function of check valve shall be to eliminate re-priming with each cycle. Pumps requiring separate suction check valves to prime or re-prime will not be acceptable.

Re-prime – The pump must be able to re-prime without the check valve installed.

.16) Impeller

Pump impeller shall be of the two (2) vane semi-open, non-clog type of close-grained ductile iron, ASTM-A536 with integral back vanes, threaded to the pump shaft and secured with a stainless steel impeller washer and bolt.

Impeller shall be mechanically secured to the pump shaft by a steel key or other device approved by the Engineer.

Pump shall be provided with a means for externally adjusting the clearance between the impeller and the wear plate.

.17) Seal

The back plate and stuffing box shall be of close-grained ductile iron, ASTM-A536 and bolted to the casing. The cavity in the cover shall be an open dished design with deflector vanes to positively remove build-up of material / gas / air pockets from the seal faces and spring through a cyclonic action "CYCLO-SEAL" to extend the life of the seal. Shaft sealing shall by means of a single mechanical John Crane Type 2 shaft seal with tungsten carbide / silicon carbide seating and mating rings, 316 stainless steel constructions. The design shall allow for continuous operation without the need for external flush water or venting. Double seals or cartridge seal with water flush are not acceptable.

Mechanical seal shall be lubricated from an independent oil filled reservoir. A clear sight gauge will be fitted to provide easy monitoring of the seal oil level and condition without removing any screws. A vent system will be in place in case of overfilling or pressure. An atmospheric vent between the mechanical seal chamber and the bearing chamber shall form part of the pump protection.

Each mated seal surface shall be lapped to insure that the seal faces are in full contact at all times. The seal seat must be self-aligning during periods of shock load that will cause deflection, vibration and axial or radial movement of the pump shaft.

Pumps shall be provided with oil lubricated seals which shall be lubricated with oil contained in a separate oil-filled reservoir.

.18) Shaft Bearing

The shaft bearing shall be of ample size and proper design to withstand all radial and thrust loads incurred during normal pump operation. Bearings shall be oil lubricated, with the bearing pedestal cooled by pumped liquid. The steel alloy pump shaft shall be protected by a steel alloy Brinell 313, shaft sleeve through the mechanical seal cavity. The pump shaft shall be sealed against leakage by a balanced mechanical seal. Both the stationary sealing member and mated rotating member shall be of Silicon Carbide.

.19) Shaft

The shaft shall be constructed of ANSI1144 stress proof alloy steel. The shaft shall be accurately machined and polished and of sufficient size to transmit full driver output without excessive flexure or stressing. Shaft deflections shall not exceed 0.1524 mm measured at end of shaft when operating at the specified design.

.20) Coupling Guards

Pump coupling shall be enclosed in a guard constructed of any one, or combination of materials consisting of expanded, perforated or solid sheet metal.

.21) Pump and Motor Base

The unit base shall be fabricated of commercial grade steel of adequate thickness to prevent flexing or warping under operating conditions.

All seams shall be made with continuous bead welds.

The unit base shall be flanged and drilled on opposite sides to which mounting studs or bolts may be attached for securing the base to the pad.

Pump motor base shall be constructed so as to permit motors to be moved to adjust tension of drive bolts.

✺ **Quality management**

- A quality management plan shall be submitted for the design, manufacturer, installation and commissioning of the pumps, for approval by the Client's representative on site

✺ **Testing**

a) **Before commissioning**

☑ Refer to Standard Specification

☑ **If requested a pump test at the manufacturer/supplier pump test facility to be witnessed by the Client's Representative on site**

- ☑ Test for correct rotation of motors
- ☑ Test for correct operation of control gear
- ☑ Test for correct alignment of shafts, belts & pulleys
- ☑ Submit all certificates required
- ☑ Submit all operation & maintenance manuals

b) **Commissioning**

- ☑ If the equipment meets the duty requirements
- ☑ Any other performance tests as specified
- ☑ Where a power test is required, the power absorbed by each motor at duty point does not exceed the values stated in the technical data sheets by more than 5%
- ☑ Where a vibration test is required, the vibration measured at each point does not exceed the level prescribed in BS 4675 Part 1 for the appropriate class of machine

c) **After commissioning**

- ☑ Monitor and record all data & performance for the specified test & trail period

M_P5.8 CHLORINATION EQUIPMENT

Cl_2.1 General

The method of disinfection shall be with Cl_2 gas dissolved in water and dose into the effluent stream. The Cl_2 shall be mixed with water by means of a vacuum operated system. Cl_2 will be transported and stored in the standard **68 kg** cylinders. The contractor shall pay the deposit for the hiring of the first **six** (6) full bottles on behalf of the client.

Cl_2.2 Equipment description

Cl_2.2.1 The gas feed system is a vacuum operated system designed to feed Cl_2 into a stream of water at a maximum required rate of 1.2 kg/hour. **NB: Chlorine shall be drawn from two cylinders at a time**. The maximum chlorine withdrawal rate from one cylinder is ± 0.65 kg/hour. The system comprises four main items interconnected by the injector vacuum pipeline:

Cl_2.2.2 A remote mounted aspirator type injector, used to produce the vacuum required to pull the gas from the cylinder, mix it with water and deliver it to the point of application.

Cl_2.2.3 A vacuum demand valve designed to fit directly to gas cylinder, for full vacuum operation. The valve ensures that gas can only be feed when there is a demand (vacuum).

Cl_2.2.4 A flow meter unit that is mounted directly on the vacuum demand valve. The flow meter (rota meter) is fitted with a calibrated tube for gas measurement and the gas flow is adjustable by means of a V-notch plug. The metering indication on the flow meter must clearly cater for adjustments in the gas flow rate when gas flow is 0.2 to 0.3 kg/hour.

The vacuum demand valve must have a pressure relief valve built in.

Cl_2.2.5 A correctly rated effluent booster pump to suit the ejector supplied for vacuum creation. Some suppliers rate the maximum Cl2 supply as 5 kg/hour with a 19 mm ejector. The normal supply required at the plant at full capacity is ± 0.2 to 0.3 kg/hour.

The tenderer shall include all pipework, dosing nozzle, fixing brackets and pressure release pipework

in the price.

Cl_2.3 Safety Equipment

Allowance is made in the electrical contract for an extraction fan with outside mounted switch at the chlorine room.

The following safety equipment must be supplied:

Cl_2.3.1 Approved chlorine notice wall charts at all entrances to chlorine room.

Cl_2.3.2 First aid cabinet containing Linctus Codeine, Modem plastic eye-wash bottles and document with first aid instruction.

Cl_2.3.3 Full face piece self-contained breathing apparatus.

Cl_2.3.4 A gas leak detector system (ammonia) or approved.

Cl_2.3.5 A tap with extension water pipe for washing down, outside the chlorine building. Water supply from constant water supply source.

MP5.9 **Rotary Roots Air Blowers** (pressure – vacuum)

✺ Description

✺ The blower shall be of the positive displacement type with preference to the 3-lobe arrangement and low air delivery pulse system. *The existing electrical equipment & blowers with electrical motors were damaged and the same building will be reused for the replacement blowers.* The new blowers need to deliver slightly more than the old blowers with the only change a 7.5 kW motor

✺ Duties

The duty specification shall be related to the following atmospheric data:

a) Absolute pressure: = 1 013 mbar or 760 mm Hg pressure
b) Temperature: = 20°C
c) Relative humidity = 60%
d) Weight of air = 1.2 kg/m³
e) Delivery airflow = 117 CFM
f) Operating pressure= 7 PSI
g) Rotary lobe rotating ≤ 1500 RPM

✺ Description of Components

- Bearings
- Lip seal
- Gears
- Oil splash lubrication mechanism
- Rotors
- Casing with suction & outlet flanges
- Shaft
- Gas seal
- Casing sides
- Double inlet filters
- Pulsating damper and silencer outlet chamber
- Drive belt if silencer box configuration
- Vacuum gauge on inlet side & Pressure gauge on outlet side both with shut-off valve for removal and replacing
- Temperature gauge on outlet side with sensor for motor cutout
- NRV on outlet side
- Solenoid valve for startup blow-off with pressure relief valve on outlet side. Pressure relief valve set at 1.2 bar.
- Outlet isolating valve that can withstand a temperature of 160°C

✺ **Materials of Construction and finish**

Refer to the Standard Specification MS for stainless steel welding and treatment

- Blower casing : Cast iron to BS, DIN or applicable standard
- End cover panels : Cast Iron
- Rotors & integrated shaft : Cut & grinded SG iron
- Bearings : Reinforce steel rolling type rated for a life span of 100 000 hours
- Gears : Helical tooth synchronizing gear with ground surfaces in volute profile

✺ **Quality management**

- A quality management plan shall be submitted for the design, manufacturer, installation and commissioning of the mechanical screen, for approval by the Client's representative on site

✺ **Testing**

a) **Before commissioning**

☑ Refer to Standard Specification

☑ Test for correct rotation of motors

☑ Test for correct operation of control gear

☑ Test for correct alignment of shafts, belts & pulleys

☑ Submit all certificates required

☑ Submit all operation & maintenance manuals

b) **Commissioning**

☑ If the equipment meets the duty requirements

☑ Any other performance tests as specified

☑ Where a power test is required, the power absorbed by each motor at duty point does not exceed the values stated in the technical data sheets by more than 5%

☑ Where a vibration test is required, the vibration measured at each point does not exceed the level prescribed in BS 4675 Part 1 for the appropriate class of machine

c) **After** c**ommissioning**

☑ Monitor and record all data & performance for the specified test & trail period

Aeration Air Discs/Domes (pressure – vacuum)

✺ **Equipment Description**

Fine-bubble diffuser: Supply and install a Jetflex disc fine-bubble diffuser, or approved equivalent, approximately 270 mm (9 in) diameter, with an EPDM membrane and PPGF base body, designed for an airflow of approximately 1.35 L/s per diffuser. Include all necessary fittings and accessories and install in accordance with the manufacturer's recommendations.

✺ **Aeration Disk Components**

- Main body/support dish with backflow preventor/NRV & Female socket
- EPDM fine bubble aeration membrane
- Screwed-on/or lock-on membrane retaining ring
- Rubber or PVC saddle with U clamp adaptors for fitting to 2", 3", 4" or 90 mm Ø pipes
- Additional material to be supplied with disks

  Air piping saddles and floor fixing brackets & bolts

✺ **Preliminary Duties**

Preliminary calculations:

Immersion depth to top of dome = 3 m

MP5.10 **SV 300/2 side channel blower**

✺ **Duties**

The duty specification shall be related to the following atmospheric data:

h) Absolute pressure: = 1 013 mbar or 760 mm Hg pressure
i) Temperature: = 20°C
j) Relative humidity = 60%
k) Weight of air = 1.2 kg/m³
l) Delivery airflow = 176 CFM
m) Operating pressure = 8.2 PSI
n) Rotary lobe rotating ≤ 1500 RPM

✺ **Description of Components**

- Bearings
- Lip seal
- Gears
- Oil splash lubrication mechanism
- Rotors
- Casing with suction & outlet flanges
- Shaft

- Gas seal
- Casing sides
- Double inlet filters
- Pulsating damper and silencer outlet chamber
- Drive belt if silencer box configuration
- Vacuum gauge on inlet side & Pressure gauge on outlet side both with shut-off valve for removal and replacing
- Temperature gauge on outlet side with sensor for motor cutout
- NRV on outlet side
- Solenoid valve for startup blow-off with pressure relief valve on outlet side. Pressure relief valve set at 1.2 bar.
- Outlet isolating valve that can withstand a temperature of 160°C

✺ **Materials of Construction and finish**

Refer to the Standard Specification MS for stainless steel welding and treatment

- Blower casing : Cast iron to BS, DIN or applicable standard
- End cover panels : Cast Iron
- Rotors & integrated shaft : Cut & grinded SG iron
- Bearings : Reinforce steel rolling type rated for a life span of 100 000 hours
- Gears : Helical tooth synchronizing gear with ground surfaces in volute profile

✺ **Quality management**

- A quality management plan shall be submitted for the design, manufacturer, installation and commissioning of the mechanical screen, for approval by the Client's representative on site

✺ **Testing**

a) **Before commissioning**

☑ Refer to Standard Specification

☑ Test for correct rotation of motors

☑ Test for correct operation of control gear

☑ Test for correct alignment of shafts, belts & pulleys

☑ Submit all certificates required

☑ Submit all operation & maintenance manuals

b) **Commissioning**

☑ If the equipment meets the duty requirements

☑ Any other performance tests as specified

☑ Where a power test is required, the power absorbed by each motor at duty point does not exceed the values stated in the technical data sheets by more than 5%

☑ Where a vibration test is required, the vibration measured at each point does not exceed the level prescribed in BS 4675 Part 1 for the appropriate class of machine

c) **After commissioning**

☑ Monitor and record all data & performance for the specified test & trail period

Aeration Air Discs/Domes (pressure – vacuum)

✺ **Equipment Description**

✺ Coarse-bubble diffuser: Supply and install a Jäger Jetflex CBD SS D24, or approved equivalent, stainless-steel coarse-bubble diffuser, 630 mm long, complete with all necessary fittings and specials, as shown on the detail drawing. Follow the manufacturer's installation requirements.

✺ **Aeration Disk Components**

- Main body/support dish with backflow preventor/NRV & Female socket
- EPDM fine bubble aeration membrane
- Screwed-on/or lock-on membrane retaining ring
- Rubber or PVC saddle with U clamp adaptors for fitting to 2", 3", 4" or 90 mm Ø pipes
- Additional material to be supplied with disks

  Air piping saddles and floor fixing brackets & bolts

✺ **Preliminary Duties**

Preliminary calculations:

Immersion depth to top of dome = 2.5 m

ES -ELECTRICAL, INSTRUMENTATION & GENERATOR PROJECT SPECIFICATION

CONTRACT No: HGDM902/HGDM/2026

HARRY GWALA DISTRICT MUNICIPALITY

UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

ES ELECTRICAL, INSTRUMENTATION & GENERATOR PROJECT SPECIFICATION

ES .1 GENERAL INFORMATION

ES .1.1 STANDARDS AND REGULATIONS

ES .1.1.1 GENERAL

The Standard Specifications forming part of this tender document shall apply unless otherwise indicated in this section. The Project Specification shall take preference if any discrepancies exist or if there are any uncertainties. The drawings issued herewith are to be read in conjunction with the Specifications and Schedules contained herein, together with all ancillary equipment necessary for a correct and complete installation and for compliance with the codes and standards, referred to in the Specification.

The Tenderer shall at the time of tendering, draw the Employer's Representative's attention to any omission or discrepancy between the specifications and the drawings and request clarification of undefined responsibilities.

ES .1.1.2 REGULATIONS

All plant and equipment, installed and tested under this contract shall comply with the requirements of the regulations as described under the relevant clauses of this specification or the Standard Specification document included elsewhere in this enquiry as follows:

a) Electrical and ancillary installations:

- SANS 10142 - 1 & 2: "Codes of practice for the wiring of premises" as amended.
- SANS 10400: "The application of the National Building Regulations" as amended
- SANS 60439 - Parts 1 & 2 LV Switchgear and Control Assembly
- SANS 1765 and SANS 60947 – Low Voltage Switchgear and Control Gear Assemblies, Contactors and Motor Starters
- SANS 1973-1,3 - Low Voltage Distribution Boards and Control Gear Assemblies
- SANS 10199 - The Design and Installation of an Earth electrode as amended.
- SANS 10313 - The Protection of Structures against Lightning
- IEC62305 – Lightning Protection
- The Occupational Health and Safety Act (85 of 1993) as amended and contingent regulations.
- The regulations and standards of the HARRY GWALA DISTRICT MUNICIPALITY where applicable
- Applicable NRS and SANS codes for electrical equipment
- BS or IEC codes where South African codes are non-existent.
- Local or Municipal Electrical Department standards and regulations
- Government and local authorities' ordinances or other supply authority governing its use
- Any other applicable by-laws or local authority by-law and amendments
- Eskom standards and regulations where applicable
- The regulations and standards as described under the relevant sections in the Standard Specifications
- Any other applicable by-laws or local authority by-law and amendments

ES .1.1.3 QUALITY CONTROL PROCEDURES

QCP's , data sheets and associated documentation for all equipment specified in accordance with Municipality Standards or industry standards shall be submitted to the Employer's Representative or Engineer for comment and approval. No equipment shall be procured without the necessary QCP approvals.

ES .2 SCOPE OF WORK

ES .2.1 ELECTRICAL, INSTRUMENTATION & ANCILLARY WORKS

The electrical, instrumentation and ancillary work installation comprises and includes the manufacture, supply, delivery, installation, testing, commissioning, guarantee and maintenance of the following: This electrical and instrumentation contract comprises the design, supply, manufacture, delivery, testing and commissioning, maintenance and guarantee of the following:

1. Existing WWTW Plant & Buildings

a) Disconnect and remove existing MCCs and DBs that are to be replaced or require refurbishment
b) Disconnect and remove all existing electrical installatioms that are in poor state or non-compliant.This inlcuced all lighting , power points and systems, cabling systems etc complete

2. Refurbishment of existing Underberg-Himeviile WWTW

Design, manufacture and install the new Main LV Panel - A including associated switchgear, etc
Design, manufacture and install the new MCCs with starters etc as follows including associated switchgear, control equipment etc

- MCC01 - New Inlet Works
- MCC02 - Aerator Blowers
- MCC03 - Recycle Pumps
- MCC04 - RAS / Sludge Pumps
- MCC05 - Chemical/Chlorine Dosing

Submission of the MCC drawings prior to any panel construction work commencing
New power cabling from the Municipal or Eskom meter to the new stand-by generator control panel
New power cabling from the generator control panel to the new Main LV Panel - A
New power supply and cabling from the new Main LV Panel – A to the following MCCs etc

- MCC01 - New Inlet Works
- MCC02 - Aerator Blowers
- MCC03 - Recycle Pumps
- MCC04 - RAS / Sludge Pumps
- MCC05 - Chemical/Clorine Dosing

New power supply and cabling from MCC05 to MCC06 (Chemical/Chlorine Dosing MCC)
Cabling from Main LV Panel - A to existing guard house and admin building
Cabling from MCCs to all mechanical equipment, pumping and process equipment, electrical equipment etc
Cabling sleeves, and cable support systems from the MCCs to all equipment, inside buildings and under roadways etc
Instrumentation equipment including low level float switches and level instruments for the sumps and pump station
Instrumentation including no flow switches on the delivery pipework of each pump for no – flow protection
Sump low level floats with stainless steel chain and weights. (pump low level protection)
Electric valve actuators
Ultrasonic flow meters
Stand-by diesel generator
New DB for the existing guard house and admin building
New DB for new buildings (Blower Room, MCC Room, Recycle Pump Room, RAS Sludge Pump Room & Chemical/Chlorine Dosing Room)
New lighting for the pump room, guard house and site lighting
New small power and socket outlets for the existing guard house and admin building

New small power and socket outlets for new buildings (Blower Room, MCC Room, Recycle Pump Room, RAS Sludge Pump Room & Chemical/Chlorine Dosing Room)
New welding socket outlet for the pump rooms
Lightning protection and earthing installation for the pump room and guard house
Earthing of the complete electrical installation of the new pump station and guard house
Liaison with Eskom or other municipal supply authority for the electricity supply and facilitate connection of the new MCC to the electricity meter
Submit a preliminary schedule showing all tasks leading up to final commissioning within the stipulated timelines
Issuing of the Electrical Certificate of Compliance (COC). Separate for each building or structure
Issue of the lighting protection test and commissioning certificates
Issue of the earth test certificate
Supply 5 hard copies and 5 soft copies of the O & M manuals consisting of datasheets of all equipment, as-built drawings, programming (electronic and printed copies).
Provide training to Client's staff

ES 1.2.2 SITE & GENERAL

a) The supply and installation of new site wide lighting (external lighting on buildings are part of building elecytrics)
b) The supply and installation of main power cabling to the new mini-sub, generators, MCCs, DBs and site wide cable systems
c) All external power cable and instrumentation cable sleeves and support systems
d) Cable sleeves, manholes and associated work (manholes by civil contractor)

ES 1.2.3 INSTRUMENTATION

e) The supply and installation of new mag or ultasonic flow meters on the delivery rising main line from the new recycle pumps, WAS pumps, sludge pumps and Seconc Class Water Pumps
f) Open channel flow meter on the inlet to th works
g) Ultrasoninc level indicators in each of the sumps for control of the pumps (start and stop)
h) Level cut out floats in the new sumps of the pump stations
i) No-flow swithes on the delivery pipework of each pump
j) Electric valve actuators on the inlet works
k) All instrumentation cabling

ES 1.2.4 STAND-BY DIESEL GENERATORS

Stand-by generators will be provided for the site under this contract install at the entrance to the WWTW or in the old existing un-used building. The generator with its own control panel will be installed with as approximate capacity of 150KVA.

Refer to the project specifications PS- SDG and the BOQ for the details and specifications of the gen-sets to be provided. This is included elsewhere in the tender documents.

The specifications and BOQ are included elsewhere in this tender document, please refer to these for the full details.

ES 1.2.5 OVERVIEW OF PUMPING SYSTEMS & OTHER MECHANICAL & PROCESS SYSTEMS

1. Underberg-Himeville WWTW

The following is a list of the major pumping, mechanical and process equipment that will be installed for the upgraded WWTW under the mechanical and process scope of works:

a) De-Gritter Pumps P1 & P2: 2 l/s @ 4 m head -: Tsurumi HSD submersible or similar approved with agitator & tungsten chromium impeller (grit removal from vortex de-gritters) approx - 0.55 kW

b) Immersible Recycle Pumps P3 & P4 : 3 l/s @ 3.5 m head - Hidrostal immersible pump or similar approved – approx 0.75 kW

c) Aeration Blowers RRB1 & RRB2: 70 l/s @ 5 m head - Universal Rai - Roots Rotary Lobe Blower or similar approved – approx 5.9 kW

d) Side Channel Blowers SCB1 & SCB2: 70 l/s @ 4.2 m head - Becker side channel blower SV 300/2 or similar approved – approx 4.5 – 5.5 kW

e) Second Class Water Pumps P5 - 2 l/s @ 40 m head - Water pressure sustaining pump Tesk SVM – approx 1.37 kW

f) Sludge Draw-Off Pumps P6 & P7:9 l/s @ 15 m head - Sludge draw-off pumps - dry sump - approx 7.5 kW

g) RAS Sludge draw off pumps P8 & P9: 9l/s @ 15 m head - RAS pumps - dry sump - approx – 7.5 kW

All motors for the pumps shall be WEG or similar approved, 400Volt 50Hz 3 phase and be minimum IE3 efficiency. Motors above 3kW capacity shall have anti-condensate heaters.
Motors equal to and above 7,5kW shall be fitted with temperature thermistors.

Motors are to be VSD, Soft Starter or DOL driven as specified.

All pumps, blowers and other equipment shall be operated on a duty and stan-by basis as specified.

The new pumps and grinder will be driven from a new MCC which will be installed in the new pump room.
.
The pumps, blowers and other mechanical equipment will be manually controlled and also be automatically controlled as described under the relevant electrical and MCC sections. Of the two pumps or blowers to be installed, under the normal conditions one pump or blower will be operating as the duty pump, with the second pump acting as a standby.

The new pumps, motors, blowers and other mechanical equipment will be supplied by the mechanical pump contractor.

The Main LV Panel and MCCs will be fed from the Eskom or municipality power meter.

ES 1.2.6 EXCLUSIONS (ITEMS BY MAIN CIVIL CONTRACTOR OR BY OTHERS)

Parts of the installation to be undertaken by local authorities, civil contractor specialists or other sub-contractors or installation work that is not allowed for is defined below and covers the following general sections:

a) PLC & HMI (Future)
b) SCADA sustems (Future)
c) UPS (Future)
d) Telemetry Systems (Future)
e) The telephone/data/IT/PA/CCTV/alarm/intercom/security and fire dection wiring, equipment and connections.
f) Geysers and hot water appliances or apparatus
g) Solar power systems
h) The intercom/security, fire detection wiring, equipment and connections.
i) The Eskom or Municipality incoming main supply covered by the supply authorities responsibilities to a defined consumer responsibility point.
j) Any item of a building or structural component including louvres, grilles etc
k) Builders work details , openings in brickwork , floors , slabs etc.
l) Manholes
m) Mechanical equipment, pumps, dosing equipment and motors etc (by mechanical contractor)

ES .3 DRAWINGS

The following civil and pump station drawings are issued and shall form part of the tender documents and should be read with the specifications at all times.

: Site Plan – Electrical Layout

The electrical and instrumentation drawings will be issued to the contractor during the constructions stages and may be in a hand sketch drawing format. Alternatively, the Engineer will issue site instructions or directions on site of what the requirements are to be.

ES .4 POWER SUPPLY & ELECTRICAL SYSTEMS

ES .4.1 MAIN INCOMING POWER SUPPLY

The power provider is to be ascertained as either being Eskom or municipality supply. There is an existing power connection on site, the capacity and details are to be ascertained and confirmed.

The contractor shall be responsible to liase with Eskom or the Municipality for the up-graded or new supply and make all applications for the electrical connections. He shall be in attendance for all applications, negotiations and switch on of the supply to the site/s.

The costs of any electricity up-grades or new supply shall be paid for by the contractor and is included as provisional sums covered in the bill of quantities.
Stand-by generator power will be provided for the WWTW site, with mains power coming to the gen-set change over panel. This must be taken into account in the design of the MCC and electrical systems.

ES .4.2 RETICULATION ON SITE

The low voltage supply distribution and reticulation on site is to be a 230/400volts system. All new systems shall match this rating.

ES .5 CONTROL PANELS, MCC's & DISTRIBUTION BOARDS

ES .5.1 General

The MCC design shall be undertaken by personnel who are qualified and able to demonstrate experience in the field of water treatment and pumping plant including PLC control and telemetry systems.

The construction of the main and local control panels and distribution boards shall be in accordance with the following Codes and Standards:

- The latest issue of SANS 556: "Low-voltage switchgear Part 1: Circuit-breakers
- The latest issue of SANS 1765: "Low-voltage switchgear and control gear assemblies (distribution boards) with a rated short-circuit withstand strength up to and including 10 kA"
- The latest issue of SANS 60439 1-5: "Low-voltage switchgear and control gear" assemblies
- The latest issue of SANS 60947: 1-8: "Low-voltage switchgear and control gear",
- The latest issue of SANS 1973: "Low-voltage switchgear and control gear Assemblies Part 1-8"

ES .5.2 Drawings and Data To Be Provided By Contractor

The contactor shall provide to the Client and the Employer's Representative or Engineer comprehensive and detailed specifications, wiring and layout diagrams etc of the following for comments and approval:

- Wiring and layout diagrams of all motor control panels, local control panels, main panels, distributions boards etc
- Component and parts list of all motor control panels and distribution boards
- FDS (Functional Design Specifications) where applicable
- P & I D diagrams for the entire project where applicable

- Process flow diagrams where applicable
- PLC wiring diagrams where applicable
- PLC I/O lists where applicable
- PLC program where applicable
- Process control network diagrams where applicable
- Instrument loop block diagrams where applicable
- Instrument tag numbers
- Cable schedule and numbering (power and instrumentation)
- Cable block diagrams

The above requirements will only apply to what is specified for this project only.

The Client and the Employer's Representative or Engineer will comment and confer approval once these satisfy the specifications and requirements. These drawings shall be revised when changes are required and be updated to as-built for inclusion in the operations and maintenance manuals.

ES 1.5 3 MCC01 – INLET WORKS

The MCC shall be wall or floor mounted IP65 motor control panel constructed of 3CR12 material and is to be installed in the new MCC room. The MCC must be installed on 300mm high HDG painted steel base with wrap around galvanised painted covers

There are cubicles in this MCC which will be equipped with switchgear, soft starters and control gear to feed and control the new de-gritter pumps, second water pumps and electric actuators with all control systems.

The MCC shall be equipped with all the necessary feeders or starters for the various motors and power systems for the various instruments. All critical panel components such as system trips, run, stop, off, etc. shall be linked to a future PLC system with facilities to link back to a future SCADA system. Facilities for interlocks, trips, alarms and trends shall be provided for logging onto a future SCADA for history data and monitoring. All equipment and control systems shall suit the requirements of the FDS and P & I D diagrams to be prepared and submitted by the electrical contractor/panel builder. Equipment shall be manually controlled locally in the MCC and automatically.

The MCC main switch shall be rated at 60 Amps three phase at a fault level of 10 kA. The panel shall be bottom cable entry only.

The motor control panel builder shall determine if the switchgear can fit in the spaces provided.

VSD's and soft starters shall have a removable, password locked keypad on door.

The MCC shall be equipment with a Schneider PM5000 or similar approved digital power meter and analyser.

The MCC shall be designed, installed and tested in accordance with industry standard specifications. The type of electrical equipment components shall be as per the Client's approval and standards or as per the equipment schedule attached.

All equipment where 2 or more off are provided shall be operated on duty and stand-by basis or as specified. All trips shall have a re-set push button and must be wired into the control circuit.

Generally, the panel shall consist of and equipped with the following:

Panel 1: Incomer
This panel shall contain the following:

- One set of suitable sized three phase and neutral copper bus bars complete with support insulators in accordance with the Standard Specifications. One substantial copper earthing bar complete with sufficient number of studs or bolts, nuts, and washers for the incoming and outgoing earth conductors.
- One 60 Amp 400 Volts suitably rated triple pole CB switch lockable in the "off" position and shall be

compliant with type 2 co-ordination. All live parts of the switch shall be shrouded to prevent inadvertent contact by maintenance personnel.

- 3 No. HRC Voltmeter fuses.
- 3 No. Current transformers.
- 1 No. Power meter Schneider PM5000 with facilities for phase / phase / neutral voltages and current on all 3 phases.
- 1 No. Set fuses with mains and phase failure relays incorporating phase loss, phase reversal, under voltage, over voltage and phase imbalance.
- 1 No. Power on indication light.
- 1 No. 4 Pole Surge arresters as specified in the Standard Specification.

Panel 2: DOL Duty Starter - 1,1kW 400V Vortex De-gritter Pump 1

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 1,1kW DOL Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
Set circuitry for E-Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " De-Gritter Pump 1 "

Panel 3: DOL Stand-By Starter 1,1kW 400V Vortex De-Gritter Pump 1

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 1,1kW DOL Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No Elsec Earth Leakage protection for outdoor pump
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
Set circuitry for E-Stop

1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " De-Gritter Pump 2"

Panel 4: VSD Duty Starter 1,75 kW 400V Second Class Water Pump 1

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 1,1kW VSD starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Elsec Earth Leakage protection for outdoor pump
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
Set circuity for E-Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Second Class Water Pump 1 "

Panel 5: VSD Stand-By Starter 1,75 kW 400V Second Class Water Pump 2

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 1,1kW VSD starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
Set circuitry for E-Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Second Class Water Pump 2"

Panel 6: VSD Duty Starter 1,1 kW 400V Tanker 2 Immersible Pump 1

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 1,1kW VSD starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No Elsec Earth Leakage protection for pump protection
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
Set circuitry for E-Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Tanker 1 - Immersible Pump 1 "

Panel 7: VSD Stand-By Starter 1,1 kW 400V Tanker 2 Immersible Pump 1

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 1,1kW VSD starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No Elsec Earth Leakage protection for pump protection
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
Set circuitry for E-Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Tanker 1 - Immersible Pump 2 "

Panel 8: Actuators 1 - 3

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
3 No. HRC fuse.
1 No. Control link.

3 No Feeder Circuit for 400Volt 0,75KW electrically actuated valves
3 No. DOL Starter for Actuator Supply with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
3 No Manual -Off - Auto Switch with stop/start push buttons
1 No 6A MCB (controls)
3 x timer and no-flow trip circuit (no flow delay)
3 Set Actuator run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
3 Sets on-off-auto selector switches
3 Sets stop/ start push buttons
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer Controls . Future PLC controls and interface)

This panel shall be labelled " Actuator Feeder 1 – 3 "

Panel 9 – Domestic Distribution :

The panel shall be equipped as follows:

- 1 No. 40Amp TP Main Switch or Isloator and busbars or droppers
- 1 x 60Amp/30ma earth leakage relay for plug circuit
- 2 x 20Amp SP CB 9 plugs)
- 3 x 15Amp SP CB (lights)
- 1 x 5Amp SP CB (telemetry panel)
- 1 x 5Amp SP CB (photo cell)
- 1 x 5Amp SP CB (by-pass)
- 1 x 20Amp TP (Feed to local DB)
- 1 x 40 Amp TP CB with EL protection (welding plug)
- 1 x 20 Amp TP CB with 1 x 10Amp TP contactor with overload , start/stop push buttons and start/stop indication lights for extract fan circuits
- 2 x 10 Amp SP CB (spares)

Panel 10 - Pump Controls :

The panel shall be equipped as follows:

- 1 No. Control circuit HRC fuse
- 1 No. Neutral link
- Set Surge arresters on main power supply
- 2 No 5Amp CB (spares)
- Suitable terminals , bases etc as required
- Sutable contacts, timers and relays etc as required (pumps protection and interlocks)
- Suitable surge arrestors for all 12/24Volt field instruments
- 24V DC power supply for instruments (level sensor, flow meters etc)
- 4 x 5Amp SP CBs for power supply to instruments
- Level transmitter in panel
- Set Surge arresters on main power supply

Panel 11 - (Future PLC & HMI) – Spare Panel

Panel 12 - Controls :

Automatic and Manual Mode

The de-gritter pumps shall operate manually, only one at a time . In automatic mode it shall operate by adjustable timers. The de-gritter pumps must operate on duty- standby philosophy. Only one de-gritter pump must start at a time and there must be an interlocking in the control systems to prevent the other pump from starting while the one is running. The interlock must only inhibit the pump when a start attempt is made. The duty pump/s must be automatically rotated.

The Tanker 1 sewage immersible pumps shall operate manually. In automatic mode it shall operate by timer and level sensor to stop the pump at high or low level. (TBC)

The second class water pressure sustaining pumps shall operate manually on a duty and stand-by basis, in automatic mode it shall operate by pressure sensor/transmitter. (low pressure start ; high pressure stop). Interlocking shall be provided so that only one pump can operate at any given time

The final control philosophy shall be developed by the control panel builder in conjunction with the Engineer and this shall be catered for in the pricing.

In Manual Mode, all pumps shall operate when they are locally selected to do so, using the Auto/Manual/Off selector switch and the push buttons on the panel door. All pump protection shall be active under the manual and auto mode.

Each pump must have, “Overload Trip” and “Under-Current Protection “. All pump trip signals must de-energize a “Pump Inhibit” relay which will trip the pump.

The pumps(all) shall draw raw sewage from the on-site suction sump (wet well) . A no-flow switch shall be installed on the delivery side of each pump to trip the pump should a no flow condition arise. This is to protect the pump from dry running. Low level floats shall be installed in the suction sump to cut out the pump/s should the sump levels be low. These levels shall be determined on site later. Hard-wired trip signals including the inhibit, low level cut-out, etc shall be wired into the pump control circuit (unless agreed with Engineer during review of the electrical drawings).

When the pump inhibit relay/s are activated, the inhibit indication lamp on the pump panel must also be activated and the stand-by pump started, if available. Pumps must automatically start up after a trip has been reset/cleared. Should any pump fail to start, after a period of 10 seconds, the next available pump should be requested to do so.

The duty pump/s must automatically start up after power is restored in the event of a power failure. All pumps must be limited to a maximum of ten starts per hour. All other protection and other features, as mentioned in the contract document and standard specifications must be incorporated as required.

The actuators shall operate as follows :

i) V1 – 50 Dia electrically actuated valve on pipeline between Tanker Dumping Structure 1 and Tanker Dumping Structure 2 – Open by manual push buttons. Timer (adjustable) to allow the actuator to stay open for a preset time and close (say 10min) before closing
ii) V2 – 50 Dia electrically actuated valve on pipeline to second screen chamber in Tanker Dumping Structure 2 – Open and close by level indicator in sewage holding tank (with adjustable timers on both closing and opening)
iii) V3 - 50 Dia electrically actuated valve on pipeline between holdimg tank and sludge pumps in Tanker Dumping Structure 2 – Open and close by level indicator in sewage holding tank (with adjustable timers on both closing and opening)

Panel 13 : Telemetry

Telemetry control will not be required under this phase of the project but could be incorporated at a later stage. This must be taken into account in the design of the MCC and electrical system.

A “future Telemetry Control” feature must be incorporated into the design which will provide remote control.

The pumps shall be automatically controlled by levels (ultrasonic level sensor) for starting and stopping of the pumps and for level monitoring. The final levels shall be set during the commissioning stages of the pump station.

Marshalling:

Signals shall include but are not limited to what is required below. The electrical panel builder and Engineer shall determine the final requirements.

The following minimum signals shall be provided as specified in the project and standard specifications:

Pump Signals: (per pump)

Auto / manual

Pumps run/stop

Pumps trip

Pumps run hours

No flow

Thermistor trip

Pressure (optional if installed)

Mains: Power On or Off

Generator : Running

Stop / tripped

Fuel level

Low fuel alarm

Instrumentation Signals:

Pumps no flow trip

Sump low level trip

Sump high level

Sump high-high level

Flow

Actuated valve – open/close indication

Intruder alarm

24V DC fuse fail

Other signals as determined with the Engineer and the contractor

Panel 14 - Spare

ES 1.5.4 MCC02 - BLOWERS

The MCC shall be wall or floor mounted IP65 motor control panel constructed of 3CR12 material and is to be installed in the new MCC room. The MCC must be installed on 300mm high HDG painted steel base with wrap around galvanised painted covers.

There are cubicles in this MCC which will be equipped with switchgear, soft starters and control gear to feed and control the new blowers etc with all control systems.

The MCC shall be equipped with all the necessary feeders or starters for the various motors and power systems for the various instruments. All critical panel components such as system trips, run, stop, off, etc. shall be linked to a future PLC system with facilities to link back to a future SCADA system. Facilities for interlocks, trips, alarms and trends shall be provided for logging onto a future SCADA for history data and monitoring. All equipment and control systems shall suit the requirements of the FDS and P & I D diagrams to be prepared and submitted by the electrical contractor/panel builder. Equipment shall be manually controlled locally in the MCC and automatically.

The MCC main switch shall be rated at 60 Amps three phase at a fault level of 10 kA. The panel shall be bottom cable entry only.

The motor control panel builder shall determine if the switchgear can fit in the spaces provided.

VSD's and soft starters shall have a removable, password locked keypad on door.

The MCC shall be equipment with a Schneider PM5000 or similar approved digital power meter and analyser.

The MCC shall be designed, installed and tested in accordance with industry standard specifications. The type of electrical equipment components shall be as per the Client's approval and standards or as per the equipment schedule attached.

All equipment where 2 or more off are provided shall be operated on duty and stand-by basis or as specified. All trips shall have a re-set push button and must be wired into the control circuit.

Generally, the panel shall consist of and equipped with the following:

Panel 1: Incomer
This panel shall contain the following :

- One set of suitable sized three phase and neutral copper bus bars complete with support insulators in accordance with the Standard Specifications. One substantial copper earthing bar complete with sufficient number of studs or bolts, nuts, and washers for the incoming and outgoing earth conductors.
- One 60 Amp 400 Volts suitably rated triple pole CB switch lockable in the "off" position and shall be compliant with type 2 co-ordination. All live parts of the switch shall be shrouded to prevent inadvertent contact by maintenance personnel.
- 3 No. HRC Voltmeter fuses.
- 3 No. Current transformers.
- 1 No. Power meter Schneider PM5000 with facilities for phase / phase / neutral voltages and current on all 3 phases.
- 1 No. Set fuses with mains and phase failure relays incorporating phase loss, phase reversal, under voltage, over voltage and phase imbalance.
- 1 No. Power on indication light.
- 1 No. 4 Pole Surge arresters as specified in the Standard Specification.

Panel 2: Soft Starter Duty Starter - 5,5kW 400V Fine Bubble Blower 1

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 5,5kW Soft Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
Set circuitry for E-Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Blower 1 "

Panel 3: Soft Starter Stand-By Starter - 5,5kW 400V Fine Bubble Blower 2

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 5,5kW Soft Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No Elsec Earth Leakage protection for outdoor pump
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
Set circuitry for E-Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Blower 2"

Panel 4: Soft Starter Duty Starter - 7,5 kW 400V Aeration Blower 1

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 7,5kW Soft Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Elsec Earth Leakage protection for outdoor pump
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
Set circuitry for E-Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Blower 3 "

Panel 5: Soft Starter Stand-By Starter 7,5 kW 400V Aeration Blower 2

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.

1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 7,5kW VSD starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
Set circuitry for E-Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Blower 4 "

Panel 6 – Domestic Distribution :

The panel shall be equipped as follows:

- 1 No. 40Amp TP Main Switch or Isloator and busbars or droppers
- 1 x 60Amp/30ma earth leakage relay for plug circuit
- 2 x 20Amp SP CB 9 plugs)
- 3 x 15Amp SP CB (lights)
- 1 x 5Amp SP CB (telemetry panel)
- 1 x 5Amp SP CB (photo cell)
- 1 x 5Amp SP CB (by-pass)
- 1 x 20Amp CB (feed to Local DB)
- 1 x 40 Amp TP CB with EL protection (welding plug)
- 1 x 20 Amp TP CB with 1 x 10Amp TP contactor with overload , start/stop push buttons and start/stop indication lights for extract fan circuits
- 2 x 10 Amp SP CB (spares)

Panel 7 - Blower Controls :

The panel shall be equipped as follows:

- 1 No. Control circuit HRC fuse
- 1 No. Neutral link
- Set Surge arresters on main power supply
- 2 No 5Amp CB (spares)
- Suitable terminals , bases etc as required
- Sutable contacts, timers and relays etc as required (pumps protection and interlocks)
- Suitable surge arrestors for all 12/24Volt field instruments
- 24V DC power supply for instruments (level sensor, flow meters etc)
- 4 x 5Amp SP CBs for power supply to instruments
- Level transmitter in panel
- Set Surge arresters on main power supply

Panel 8 - (Future PLC & HMI) – Spare Panel

Panel 9 **- Controls :**

Automatic and Manual Mode

The blowers shall operate manually, only one at a time . In automatic mode it shall operate by adjustable timers. The blowers (each set) must operate on duty- standby philosophy. Only one blower must start at a

time and there must be an interlocking in the control systems to prevent the other blower from starting while the one is running. The interlock must only inhibit the blower when a start attempt is made. The duty blower/s must be automatically rotated.

The blowers shall operate manually on a duty and stand-by basis, in automatic mode it shall operate by pressure sensor/transmitter and levels in the aeration basin. (low pressure start ; high pressure stop). Interlocking shall be provided so that only one blower can operate at any given time

The final control philosophy shall be developed by the control panel builder in conjunction with the Engineer and this shall be catered for in the pricing.

In Manual Mode, all blowers shall operate when they are locally selected to do so, using the Auto/Manual/Off selector switch and the push buttons on the panel door. All blower protection shall be active under the manual and auto mode.

Each blower must have, “Overload Trip” and “Under-Current Protection “. All blower trip signals must de-energize a “Blower Inhibit” relay which will trip the blower.

These levels shall be determined on site later. Hard-wired trip signals including the inhibit, low level cut-out, etc shall be wired into the pump control circuit (unless agreed with Engineer during review of the electrical drawings).

When the blower inhibit relay/s are activated, the inhibit indication lamp on the blower panel must also be activated and the stand-by blower started, if available. Blowers must automatically start up after a trip has been reset/cleared. Should any pump fail to start, after a period of 10 seconds, the next available pump should be requested to do so.

The duty blower/s must automatically start up after power is restored in the event of a power failure. All blowers must be limited to a maximum of ten starts per hour. All other protection and other features, as mentioned in the contract document and standard specifications must be incorporated as required.

Panel 10 : Telemetry

Telemetry control will not be required under this phase of the project but could be incorporated at a later stage. This must be taken into account in the design of the MCC and electrical system.

A “future Telemetry Control” feature must be incorporated into the design which will provide remote control.

The blowers shall be automatically controlled by levels (ultrasonic level sensor) and timers for starting and stopping of the blowers. The final levels shall be set during the commissioning stages of the blower station building.

Marshalling:

Signals shall include but are not limited to what is required below. The electrical panel builder and Engineer shall determine the final requirements.

The following minimum signals shall be provided as specified in the project and standard specifications:

Blower Signals: (per pump)

Auto / manual

Blowers run/stop

Blowers trip

Blowers run hours

Thermistor trip

Pressure (optional if installed)

Mains: Power On or Off

Generator : Running

Stop / tripped

Fuel level

Low fuel alarm

Instrumentation Signals:

Blower air low
Air Flow

Actuated valve – open/close indication

Intruder alarm

24V DC fuse fail

Other signals as determined with the Engineer and the contractor

Panel 11 - Spare

ES 1.5.5 MCC03 – SEWAGE RECYCLE PUMP

The MCC shall be wall or floor mounted IP65 motor control panel constructed of 3CR12 material and is to be installed in the new MCC room. The MCC must be installed on 300mm high HDG painted steel base with wrap around galvanised painted covers

There are cubicles in this MCC which will be equipped with switchgear, soft starters and control gear to feed and control the new RECYCLE pumps etc with all control systems.

The MCC shall be equipped with all the necessary feeders or starters for the various motors and power systems for the various instruments. All critical panel components such as system trips, run, stop, off, etc. shall be linked to a future PLC system with facilities to link back to a future SCADA system. Facilities for interlocks, trips, alarms and trends shall be provided for logging onto a future SCADA for history data and monitoring. All equipment and control systems shall suit the requirements of the FDS and P & I D diagrams to be prepared and submitted by the electrical contractor/panel builder. Equipment shall be manually controlled locally in the MCC and automatically.

The MCC main switch shall be rated at 60 Amps three phase at a fault level of 10 kA. The panel shall be bottom cable entry only.

The motor control panel builder shall determine if the switchgear can fit in the spaces provided.

VSD’s and soft starters shall have a removable, password locked keypad on door.

The MCC shall be equipment with a Schneider PM5000 or similar approved digital power meter and analyser.

The MCC shall be designed, installed and tested in accordance with industry standard specifications. The type of electrical equipment components shall be as per the Client’s approval and standards or as per the equipment schedule attached.

All equipment where 2 or more off are provided shall be operated on duty and stand-by basis or as specified. All trips shall have a re-set push button and must be wired into the control circuit.

Generally, the panel shall consist of and equipped with the following:

Panel 1: Incomer
This panel shall contain the following :

- One set of suitable sized three phase and neutral copper bus bars complete with support insulators in accordance with the Standard Specifications. One substantial copper earthing bar complete with sufficient number of studs or bolts, nuts, and washers for the incoming and outgoing earth conductors.
- One 60 Amp 400 Volts suitably rated triple pole CB switch lockable in the "off" position and shall be compliant with type 2 co-ordination. All live parts of the switch shall be shrouded to prevent inadvertent contact by maintenance personnel.
- 3 No. HRC Voltmeter fuses.
- 3 No. Current transformers.
- 1 No. Power meter Schneider PM5000 with facilities for phase / phase / neutral voltages and current on all 3 phases.
- 1 No. Set fuses with mains and phase failure relays incorporating phase loss, phase reversal, under voltage, over voltage and phase imbalance.
- 1 No. Power on indication light.
- 1 No. 4 Pole Surge arresters as specified in the Standard Specification.

Panel 2: VSD Duty Starter – 7.5kW 400V Sewage Recycle Pump 1

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 2,2kW VSD Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No Elsec Earth Leakage Protection for pump protection
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
1 No circuity for E -Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled “ Sewage Recycle Pump 1 “

Panel 3: VSD Stand-By Starter – 7.5kW 400V Sewage Recycle Pump 2

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 2,2kW VSD Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No Elsec Earth Leakage protection for outdoor pump
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)

1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
Set circuitry for E-Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Sewage Recycle Pump 2"

Panel 4 – Domestic Distribution :

The panel shall be equipped as follows:

- 1 No. 40Amp TP Main Switch or Isloator and busbars or droppers
- 1 x 60Amp/30ma earth leakage relay for plug circuit
- 2 x 20Amp SP CB 9 plugs)
- 3 x 15Amp SP CB (lights)
- 1 x 5Amp SP CB (telemetry panel)
- 1 x 5Amp SP CB (photo cell)
- 1 x 5Amp SP CB (by-pass)
- 1 x 20Amp TP CB (feed to local DB)
- 1 x 40 Amp TP CB with EL protection (welding plug)
- 1 x 20 Amp TP CB with 1 x 10Amp TP contactor with overload , start/stop push buttons and start/stop indication lights for extract fan circuits
- 2 x 10 Amp SP CB (spares)

Panel 5 - Pump Controls :

The panel shall be equipped as follows:

- 1 No. Control circuit HRC fuse
- 1 No. Neutral link
- Set Surge arresters on main power supply
- 2 No 5Amp CB (spares)
- Suitable terminals , bases etc as required
- Sutable contacts, timers and relays etc as required (pumps protection and interlocks)
- Suitable surge arrestors for all 12/24Volt field instruments
- 24V DC power supply for instruments (level sensor, flow meters etc)
- 4 x 5Amp SP CBs for power supply to instruments
- Level transmitter in panel
- Set Surge arresters on main power supply

Panel 6 - (Future PLC & HMI) – Spare Panel

Panel 7 - Controls :

Automatic and Manual Mode

The recycle pumps shall operate manually, only one at a time . In automatic mode it shall operate by level sensors in the sewage sump. (start/stop by levels) The recycle pumps must operate on duty- standby philosophy. Only one pump must start at a time and there must be an interlocking in the control systems to prevent the other pump from starting while the one is running. The interlock must only inhibit the pump when a start attempt is made. The duty pump/s must be automatically rotated.

The final control philosophy shall be developed by the control panel builder in conjunction with the Engineer and this shall be catered for in the pricing.

In Manual Mode, all pumps shall operate when they are locally selected to do so, using the Auto/Manual/Off selector switch and the push buttons on the panel door. All pump protection shall be active under the manual

and auto mode.

Each pump must have, “Overload Trip” and “Under-Current Protection “. All pump trip signals must de-energize a “Pump Inhibit” relay which will trip the pump.

The pumps(all) shall draw raw sewage from the on-site suction sump (wet well) . A no-flow switch shall be installed on the delivery side of each pump to trip the pump should a no flow condition arise. This is to protect the pump from dry running. Low level floats shall be installed in the suction sump to cut out the pump/s should the sump levels be low. These levels shall be determined on site later. Hard-wired trip signals including the inhibit, low level cut-out, etc shall be wired into the pump control circuit (unless agreed with Engineer during review of the electrical drawings).

When the pump inhibit relay/s are activated, the inhibit indication lamp on the pump panel must also be activated and the stand-by pump started, if available. Pumps must automatically start up after a trip has been reset/cleared. Should any pump fail to start, after a period of 10 seconds, the next available pump should be requested to do so.

The duty pump/s must automatically start up after power is restored in the event of a power failure. All pumps must be limited to a maximum of ten starts per hour. All other protection and other features, as mentioned in the contract document and standard specifications must be incorporated as required.

Panel 8 : Telemetry

Telemetry control will not be required under this phase of the project but could be incorporated at a later stage. This must be taken into account in the design of the MCC and electrical system.

A “future Telemetry Control” feature must be incorporated into the design which will provide remote control.

The pumps shall be automatically controlled by levels (ultrasonic level sensor) for starting and stopping of the pumps and for level monitoring. The final levels shall be set during the commissioning stages of the pump station.

Marshalling:

Signals shall include but are not limited to what is required below. The electrical panel builder and Engineer shall determine the final requirements.

The following minimum signals shall be provided as specified in the project and standard specifications:

Pump Signals: (per pump)

Auto / manual

Pumps run/stop

Pumps trip

Pumps run hours

No flow

Thermistor trip

Pressure (optional if installed)

Mains: Power On or Off

Generator : Running

Stop / tripped

Fuel level

Low fuel alarm

Instrumentation Signals:

Pumps no flow trip

Sump low level trip

Sump high level

Sump high-high level

Flow

Actuated valve – open/close indication

Intruder alarm

24V DC fuse fail

Other signals as determined with the Engineer and the contractor

Panel 9 - Spare

ES 1.5.6 MCC04 – SLUDGE PUMPS & RAS PUMPS

The MCC shall be wall or floor mounted IP65 motor control panel constructed of 3CR12 material and is to be installed in the new MCC room. The MCC must be installed on 300mm high HDG painted steel base with wrap around galvanised painted covers

There are cubicles in this MCC which will be equipped with switchgear, soft starters and control gear to feed and control the new sludge and RAS pumps etc, with all control systems.

The MCC shall be equipped with all the necessary feeders or starters for the various motors and power systems for the various instruments. All critical panel components such as system trips, run, stop, off, etc. shall be linked to a future PLC system with facilities to link back to a future SCADA system. Facilities for interlocks, trips, alarms and trends shall be provided for logging onto a future SCADA for history data and monitoring. All equipment and control systems shall suit the requirements of the FDS and P & I D diagrams to be prepared and submitted by the electrical contractor/panel builder. Equipment shall be manually controlled locally in the MCC and automatically.

The MCC main switch shall be rated at 60 Amps three phase at a fault level of 10 kA. The panel shall be bottom cable entry only.

The motor control panel builder shall determine if the switchgear can fit in the spaces provided.

VSD’s and soft starters shall have a removable, password locked keypad on door.

The MCC shall be equipment with a Schneider PM5000 or similar approved digital power meter and analyser.

The MCC shall be designed, installed and tested in accordance with industry standard specifications. The type of electrical equipment components shall be as per the Client’s approval and standards or as per the equipment schedule attached.

All equipment where 2 or more off are provided shall be operated on duty and stand-by basis or as specified. All trips shall have a re-set push button and must be wired into the control circuit.

Generally, the panel shall consist of and equipped with the following:

Panel 1: Incomer
This panel shall contain the following :

- One set of suitable sized three phase and neutral copper bus bars complete with support insulators in accordance with the Standard Specifications. One substantial copper earthing bar complete with

sufficient number of studs or bolts, nuts, and washers for the incoming and outgoing earth conductors.

- One 60 Amp 400 Volts suitably rated triple pole CB switch lockable in the "off" position and shall be compliant with type 2 co-ordination. All live parts of the switch shall be shrouded to prevent inadvertent contact by maintenance personnel.
- 3 No. HRC Voltmeter fuses.
- 3 No. Current transformers.
- 1 No. Power meter Schneider PM5000 with facilities for phase / phase / neutral voltages and current on all 3 phases.
- 1 No. Set fuses with mains and phase failure relays incorporating phase loss, phase reversal, under voltage, over voltage and phase imbalance.
- 1 No. Power on indication light.
- 1 No. 4 Pole Surge arresters as specified in the Standard Specification.

Panel 2: VSD Duty Starter – 7.5kW 400V Sludge Pump 1

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 2,2kW VSD Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No Elsec Earth Leakage Protection for pump protection
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
1 No circuity for E -Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Sludge Pump 1 "

Panel 3: VSD Stand-By Starter – 7.5kW 400V Sludge Pump 2

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 2,2kW VSD Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No Elsec Earth Leakage protection for outdoor pump
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry

Set circuitry for motor heaters
Set circuitry for motor thermisters
Set circuitry for E-Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Sludge Pump 2"

Panel 4: VSD Duty Starter – 7.5kW 400V RAS Pump 1

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 2,2kW VSD Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No Elsec Earth Leakage Protection for pump protection
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
1 No circuity for E -Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " RAS Pump 1 "

Panel 5 : VSD Stand-By Starter – 7.5kW 400V RAS Pump 2

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 2,2kW VSD Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No Elsec Earth Leakage protection for outdoor pump
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1x timer and no-flow trip circuit (no flow delay)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No Relays/contacts for low level circuitry
Set circuitry for motor heaters
Set circuitry for motor thermisters
Set circuitry for E-Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " RAS Pump 2"

Panel 6 – Domestic Distribution :

The panel shall be equipped as follows:
- 1 No. 40Amp TP Main Switch or Isloator and busbars or droppers
- 1 x 60Amp/30ma earth leakage relay for plug circuit
- 2 x 20Amp SP CB 9 plugs)
- 3 x 15Amp SP CB (lights)
- 1 x 5Amp SP CB (telemetry panel)
- 1 x 5Amp SP CB (photo cell)
- 1 x 5Amp SP CB (by-pass)
- 1 x 20Amp TP CB (feed to local DB)
- 1 x 40 Amp TP CB with EL protection (welding plug)
- 1 x 20 Amp TP CB with 1 x 10Amp TP contactor with overload , start/stop push buttons and start/stop indication lights for extract fan circuits
- 2 x 10 Amp SP CB (spares)

Panel 5 - Pump Controls :

The panel shall be equipped as follows:
- 1 No. Control circuit HRC fuse
- 1 No. Neutral link
- Set Surge arresters on main power supply
- 2 No 5Amp CB (spares)
- Suitable terminals , bases etc as required
- Sutable contacts, timers and relays etc as required (pumps protection and interlocks)
- Suitable surge arrestors for all 12/24Volt field instruments
- 24V DC power supply for instruments (level sensor, flow meters etc)
- 4 x 5Amp SP CBs for power supply to instruments
- Level transmitter in panel
- Set Surge arresters on main power supply

Panel 7 - (Future PLC & HMI) – Spare Panel

Panel 8 - Controls :

Automatic and Manual Mode

The sludge and RAS pumps shall operate manually, only one at a time . In automatic mode it shall operate by level sensors in the sewage sump. (start/stop by levels) The recycle and RAS pumps must operate on duty- standby philosophy. Only one pump must start at a time and there must be an interlocking in the control systems to prevent the other pump from starting while the one is running. The interlock must only inhibit the pump when a start attempt is made. The duty pump/s must be automatically rotated.

The final control philosophy shall be developed by the control panel builder in conjunction with the Engineer and this shall be catered for in the pricing.

In Manual Mode, all pumps shall operate when they are locally selected to do so, using the Auto/Manual/Off selector switch and the push buttons on the panel door. All pump protection shall be active under the manual and auto mode.

Each pump must have, "Overload Trip" and "Under-Current Protection ". All pump trip signals must de-energize a "Pump Inhibit" relay which will trip the pump.

The pumps(all) shall draw raw sewage from the on-site suction sump (wet well) . A no-flow switch shall be installed on the delivery side of each pump to trip the pump should a no flow condition arise. This is to protect the pump from dry running. Low level floats shall be installed in the suction sump to cut out the pump/s should the sump levels be low. These levels shall be determined on site later. Hard-wired trip signals including the

inhibit, low level cut-out, etc shall be wired into the pump control circuit (unless agreed with Engineer during review of the electrical drawings).

When the pump inhibit relay/s are activated, the inhibit indication lamp on the pump panel must also be activated and the stand-by pump started, if available. Pumps must automatically start up after a trip has been reset/cleared. Should any pump fail to start, after a period of 10 seconds, the next available pump should be requested to do so.

The duty pump/s must automatically start up after power is restored in the event of a power failure. All pumps must be limited to a maximum of ten starts per hour. All other protection and other features, as mentioned in the contract document and standard specifications must be incorporated as required.

Panel 9 : Telemetry

Telemetry control will not be required under this phase of the project but could be incorporated at a later stage. This must be taken into account in the design of the MCC and electrical system.

A “future Telemetry Control” feature must be incorporated into the design which will provide remote control.

The pumps shall be automatically controlled by levels (ultrasonic level sensor) for starting and stopping of the pumps and for level monitoring. The final levels shall be set during the commissioning stages of the pump station.

Marshalling:

Signals shall include but are not limited to what is required below. The electrical panel builder and Engineer shall determine the final requirements.

The following minimum signals shall be provided as specified in the project and standard specifications:

Pump Signals: (per pump)

Auto / manual

Pumps run/stop

Pumps trip

Pumps run hours

No flow

Thermistor trip

Pressure (optional if installed)

Mains: Power On or Off

Generator : Running

Stop / tripped

Fuel level

Low fuel alarm

Instrumentation Signals:

Pumps no flow trip

Sump low level trip

Sump high level

Sump high-high level

Flow

Actuated valve – open/close indication

Intruder alarm

24V DC fuse fail

Other signals as determined with the Engineer and the contractor

Panel 10 - Spare

ES 1.5.7 MCC05 – CHEMICAL & CHLORINE DOSING PUMPS

The MCC shall be wall or floor mounted IP65 motor control panel constructed of 3CR12 material and is to be installed in the new MCC room. The MCC must be installed on 300mm high HDG painted steel base with wrap around galvanised painted covers.

The MCC shall be equipped with all the necessary feeders or starters for the various motors and power systems for the various instruments. All critical panel components such as system trips, run, stop, off, etc. shall be linked to a future PLC system with facilities to link back to a future SCADA system. Facilities for interlocks, trips, alarms and trends shall be provided for logging onto a future SCADA for history data and monitoring. All equipment and control systems shall suit the requirements of the FDS and P & I D diagrams to be prepared and submitted by the electrical contractor/panel builder. Equipment shall be manually controlled locally in the MCC and automatically.

The motor control panel builder shall determine if the switchgear can fit in the spaces provided.

VSD's and soft starters shall have a removable, password locked keypad on door.

The MCC shall be designed, installed and tested in accordance with industry standard specifications. The type of electrical equipment components shall be as per the Client's approval and standards or as per the equipment schedule attached.

All equipment where 2 or more off are provided shall be operated on duty and stand-by basis or as specified. All trips shall have a re-set push button and must be wired into the control circuit.

Generally, the panel shall consist of and equipped with the following:

Panel 1: Incomer
This panel shall contain the following :

- One set of suitable sized three phase and neutral copper bus bars complete with support insulators in accordance with the Standard Specifications. One substantial copper earthing bar complete with sufficient number of studs or bolts, nuts, and washers for the incoming and outgoing earth conductors.
- One 20 Amp 400 Volts suitably rated triple pole CB switch lockable in the "off" position and shall be compliant with type 2 co-ordination. All live parts of the switch shall be shrouded to prevent inadvertent contact by maintenance personnel.
- 3 No. HRC Voltmeter fuses.
- 3 No. Current transformers.
- 1 No. Power meter Schneider PM5000 with facilities for phase / phase / neutral voltages and current on all 3 phases.
- 1 No. Set fuses with mains and phase failure relays incorporating phase loss, phase reversal, under voltage, over voltage and phase imbalance.
- 1 No. Power on indication light.
- 1 No. 4 Pole Surge arresters as specified in the Standard Specification.

Panel 2: Soft Starter VSD Duty Starter – 0,55kW 400V Sodium Hypochlorite Dosing Pump 1

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.

1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 0,55kW Soft Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No circuity for E -Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Sodium Hypochlorite Dosing Pump 1

Panel 3 : Soft Starter Stand-By Starter – 0,55kW 400V Sodium Hypochlorite Dosing Pump 2

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 0,55kW Soft Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No circuity for E -Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Sodium Hypochlorite Dosing Pump 2 "

Panel 4: Soft Starter Duty Starter – 0,55kW 400V Chlorine Dosing Pump 1

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 0,55kW Soft Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No circuity for E -Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Chlorine Dosing Pump 1 "

Panel 5: Soft Starter Stand-By Starter – 0,55kW 400V Chlorine Dosing 2

1 No. Suitably rated TP fuse switch mechanically interlocked with the panel door. All live parts to be shrouded.
1 No. HRC fuse.
1 No. Control link.
1 No Suitably rated main contactor before the drive (with time delay off control)
1 No. 0,55kW Soft Starter (ABB, Schneider, WEG or Control Technologies range or similar) with suitable overload and anti – single phase protection with Ethernet Port to future PLC switch
1 No. Suitably rated CT and ammeter with 96 mm dial.
1 No Manual -Off - Auto switch with stop/start push buttons
1 Run hour meter
1 Start counter+
1 No 6A MCB (controls)
1 Set Motor run, motor stop, motor trip and circuit healthy indication lights (Green, Yellow, Red, White)
1 Set auxiliary relays/contacts for emergency stop lock circuitry
1 No circuity for E -Stop
1 Set Control equipment, relays, contacts, interlocks etc. for local manual and automatic controls (Refer to Controls Specification. Future PLC controls and interface)

This panel shall be labelled " Chlorine Dosing Pump 2 "

Panel 6 – Domestic Distribution :

The panel shall be equipped as follows:

- 1 No. 40Amp TP Main Switch or Isloator and busbars or droppers
- 1 x 60Amp/30ma earth leakage relay for plug circuit
- 2 x 20Amp SP CB 9 plugs)
- 3 x 15Amp SP CB (lights)
- 1 x 5Amp SP CB (telemetry panel)
- 1 x 5Amp SP CB (photo cell)
- 1 x 5Amp SP CB (by-pass)
- 1 x 40 Amp TP CB with EL protection (welding plug)
- 1 x 20 Amp TP CB (Feeder to local Domestic DB in Pump Staions, Blower Room etc)
- 1 x 20 Amp TP CB with 1 x 10Amp TP contactor with overload , start/stop push buttons and start/stop indication lights for extract fan circuits
- 2 x 10 Amp SP CB (spares)

Panel 5 - Pump Controls :

The panel shall be equipped as follows:

- 1 No. Control circuit HRC fuse
- 1 No. Neutral link
- Set Surge arresters on main power supply
- 2 No 5Amp CB (spares)
- Suitable terminals , bases etc as required
- Sutable contacts, timers and relays etc as required (pumps protection and interlocks)
- Suitable surge arrestors for all 12/24Volt field instruments
- 24V DC power supply for instruments (level sensor, flow meters etc)
- 4 x 5Amp SP CBs for power supply to instruments
- Level transmitter in panel
- Set Surge arresters on main power supply

Panel 7 - (Future PLC & HMI) – Spare Panel

Panel 8 - Controls :

Automatic and Manual Mode

The dosing pumps shall operate manually, only one at a time . In automatic mode it shall operate by adjustable timers. The dosing pumps must operate on duty- standby philosophy. Only one pump must start at a time and there must be an interlocking in the control systems to prevent the other pump from starting while the one is running. The interlock must only inhibit the pump when a start attempt is made. The duty pump/s must be automatically rotated.
The speed of the dosing pumps will be controlled locally at the pump mounted controller.

The final control philosophy shall be developed by the control panel builder in conjunction with the Engineer and this shall be catered for in the pricing.

In Manual Mode, all pumps shall operate when they are locally selected to do so, using the Auto/Manual/Off selector switch and the push buttons on the panel door. All pump protection shall be active under the manual and auto mode.

Each pump must have, “Overload Trip” and “Under-Current Protection “. All pump trip signals must de-energize a “Pump Inhibit” relay which will trip the pump.

When the pump inhibit relay/s are activated, the inhibit indication lamp on the pump panel must also be activated and the stand-by pump started, if available. Pumps must automatically start up after a trip has been reset/cleared. Should any pump fail to start, after a period of 10 seconds, the next available pump should be requested to do so.

The duty pump/s must automatically start up after power is restored in the event of a power failure. All pumps must be limited to a maximum of ten starts per hour. All other protection and other features, as mentioned in the contract document and standard specifications must be incorporated as required.

Panel 9 : Telemetry

Telemetry control will not be required under this phase of the project but could be incorporated at a later stage. This must be taken into account in the design of the MCC and electrical system.

A “future Telemetry Control” feature must be incorporated into the design which will provide remote control.

The pumps shall be automatically controlled by levels (ultrasonic level sensor) for starting and stopping of the pumps and for level monitoring. The final levels shall be set during the commissioning stages of the pump station.

Marshalling:

Signals shall include but are not limited to what is required below. The electrical panel builder and Engineer shall determine the final requirements.

The following minimum signals shall be provided as specified in the project and standard specifications:

Pump Signals: (per pump)

Auto / manual

Pumps run/stop

Pumps trip

Pumps run hours

Mains: Power On or Off

Instrumentation Signals

Intruder alarm

24V DC fuse fail

Other signals as determined with the Engineer and the contractor

Panel 10 - Spare

ES 1.5.8 DOL STARTER CONTACTORS

DOL starter contactors shall comply to IEC/SANS60947-4-1,2 & 3 and be fitted with a suitable contactor/s incorporating motor protection, overload, undercurrent and anti-single phase protection. The contactor shall have a bimetal or electromagnetic overload relay with in-built single phasing protection suitable for motor protection.
The contactors shall be appropriately rated for the anticipated full load of the motor to suit the mechanical loads.
The contactor shall be have facilities for twin push buttons for on and off switching. The contactor shall be protected by fuses or current limiting circuit breakers to protect the equipment against abnormally high inrush currents or short circuit in the electrical system.
The contactor shall have two NO and two NC coils rated at 230/415V with auxiliary contacts for control circuitry and two spares all rated at 10 ampere.
All contactors and relays shall be able to withstand the maximum prospective fault current that can occur at the point where the contactor or relay is installed and as specified in the detailed specification. All contactors and relays shall be clearly labelled.

Full details and brochures of the contactors to be used or proposed shall be provided by the contractor for comments and approval by the Engineer.

ES 1.5.9 SOFT STARTERS

Conformity of standards
EC Standard :
The soft starter shall be constructed and tested in accordance with the international IEC standards EN 60947-1 and EN 60947-4-2 and respect the following EC directives:

- "Low voltage Equipment" No. 2006/95/EC
- "Electromagnetic compatibility Directive" (EMC) No.2004/108/EC

UL Standard :
The soft starter shall be constructed and tested in accordance with UL 508.
Product features
The soft starter shall comply with the following technical requirements:

General specification

- Three phase control with operation voltage: 208 - 600VAC or 208 - 690VAC, 50/60 Hz
- Wide rated control supply voltage: 100 - 250VAC 50/60 Hz
- Built-in bypass to reduce energy consumption at full speed and increase the life time of soft starter.
- Possibility for both in-line and inside-delta connection of the motor
- The soft starter shall have built-in Modbus RTU for communication. Support for other protocols shall be an option.
- The soft starter shall be equipped with one analog output.
- The soft starter shall have a minimum of 3 signal Relays Output for Run, Bypass (Top of Ramp) and Event signal.

User interface

- The soft starter shall support multiple languages in both the manual and HMI, including: English, Swedish, German, French, Italian, Spanish, Portuguese, Dutch, Polish, Russian, Finish, Turkish, Czech, Chinese and Arabic.
- The soft starter shall have a detachable keypad with graphical LCD display. The keypad shall have start and stop buttons, information button for access to a built-in manual and an USB-port for connection to a PC.

Environmental conditions

- The soft starter shall have coated PCBAs to withstand harsh environments.
- The soft starter shall support operational temperature of -25 to +60℃ with de-rating of maximum 0.8% per ℃ above 40℃
- The soft starter shall be able to operate on up to 4000 meters above sea level with de-

rating of maximum 0.67% per meter above 1000 meters

Motor starting, stopping and operation

- The soft starter shall have pre-start functions:
  - Stand still brake, to keep the load still before start
  - Motor heating, to keep the motor well-tempered before start
- The soft starter shall have the following start ramps available:
  - Voltage start ramp
  - Torque start ramp
  - Full voltage start
- The soft starter shall have possibility for slow speed forward and backward operation for positioning of a motor load.
- The soft starter shall have Torque Control and pump cleaning feature, to eliminate water hammering and prolong lifetime of the pump system.
- The soft starter shall include a kick start feature to be able to start heavy loads.
- The soft starter shall have the following three types of current Limit:
  - Current Limit
  - Dual Current Limit
  - Current Ramp
- The soft starter shall have a limp mode feature to allow the soft starter to operate even with shorted thyristors in one phase.
- The soft starter shall have possibility for sequence start of up to 3 different motors.

Built-in motor protections

The soft starter shall integrate motor and load protections, which shall under no circumstances be disabled when the integrated bypass is used. The soft starter shall also be able to present a warning before tripping for each protection.

The soft starter shall have the following motor protections available

- Electronic Overload Protection, class 10A, 10, 20, 30
- Locked Rotor Protection
- Motor Underload Protection
- Current Imbalance Protection
- Voltage Imbalance Protection
- Overvoltage and Under Voltage Protection
- Phase Reversal Protection
- Earth-fault Protection

It shall also have input for PTC and PT100.

Built-in diagnostics

The soft starter shall have the following diagnostics features: • THD(U)-Total Harmonic Distortion

- Counted number of start sequences
- Motor runtime measurement
- Thyristor runtime measurement
- Auto phase sequence detection
- Electricity metering
- Voltage sags detection
- Time to trip estimation
- Time to cool estimation

Fault detection

The soft starter shall provide following fault detection, to protect both the starting equipment, the load and the soft starter itself

- Phase loss
- High current
- Low control supply voltage
- Fault connection
- Bad network quality
- Thyristor overload

ES 1.5.9.1 COMMUNICATION

The unit shall have an open communications system, connected directly via Ethernet , RS485 or similar plug-in connectors, via a Modbus Plus network.

ES 1.5.9.2 PREFERRED SUPPLIERS

Soft Starters and VSDs shall be by WEG, Schneider, ABB or Feedback Electronics or similar and equal approved.

ES 1.5.10 VARIABLE SPEED DRIVES (VSDs)

ES 1.5.10.1 GENERAL

VSDs shall be provided for drives as shown on the single-line diagrams and in accordance with the Electrical Project Specification. For additional information, please refer to the standard electrical specification on VSDs.

ES 1.5.10.2 SPECIFICATION

a) The drive method of the VSDs shall be Modified Sinusoidal Pulse-Width Modulation (PWM), suitable for driving motors coupled to centrifugal pumps or other loads.
The system parameters are as follows:

System voltage	400 V
Motor voltage	400 V
System fault level	15kA
Motor speed	3000 rpm (max) ; 730 rpm (min). Speed 1485 RPM for this application.
Installation	Within the MCC with ventilation fans mounted on cubicle doors
Drive Type	6 Pulse, Transistor / Diode Convertor, DC bus, Thyristor Inverter

The VSDs shall be selected to match their associated motors and loads with respect to voltage, speed range, power and load torque characteristic.
b) Newly supplied VSDs shall be equipped with RS485 / Modbus interfaces, which shall be linked via twisted pair cable to the associated PLC. This communications interface shall be utilized for speed control of the drives, as well as monitoring of the motor's load, speed, drive faults, phase voltage, current, frequency, etc.
c) For VSDs in existing MCC's not all equipped with RS485 / Modbus interfaces, speed control and monitoring shall therefore be implemented via analogue signals to and from the associated PLC (closed loop control).
Current monitoring of the drives shall be achieved by means of installing of signal converters and CT's in the new MCCs. The contractor shall provide the necessary equipment (e.g. converters, CT's, cabling, etc.) to ensure accurate monitoring thereof.

ES 1.5.10.3 INSTALLATION

The VSD's shall be installed with the heatsink mounted through the rear of the panel to facilitate the circulation of cooling air over the heatsink without drawing air over the control components of the VSD. Where this is not practically possible with smaller VSD's, the heatsink and control components may share the ventilation air.
Where two VSDs are mounted one above the other in an MCC, a 45° deflector plate shall be mounted above the fan-cooled heatsink of the lower VSD to deflect hot air away from the upper VSD's heatsink.
Where a VSD's heatsink is contained in a dedicated cubicle, a division shall be provided to separate the incoming and outgoing cooling air. Extractor fans with filters shall be installed on the doors of the VSD cubicles to increase air circulation, where necessary. The appointed contractor shall provide proof of heat dissipation within a VSD cubicle, by means of submitting heat rise calculations to the Engineer, where extractor fans are not installed.
The doors of the MCC compartments housing VSDs shall be fitted with the same control and indication equipment as those for fixed speed drives (as shown on the typical door layout drawing), but with the addition of VSD fault indication lights.
All internal wiring shall be silicone insulated panel wiring with tinned stranded copper conductors and PC boards shall have conformal coatings to provide protection against the corrosive atmosphere at the works.
A Remote Graphic Display terminal shall be installed for each of the drives, mounted on the drive's enclosure cubicle doors.

ES 1.5.10.4 INTELLIGENT MOTOR PROTECTION RELAYS (IMPR)

ES 1.5.10.4.1 GENERAL

For this installation, it is intended that intelligent motor protection relays be used for all non-electronic starters (i.e. Direct-on-Line; Forward-Reverse and Star-Delta.) This unit replaces the conventional thermal overload normally used, and will communicate on a Modbus Plus protocol with the PLC.

ES 1.5.10.4.2 CONNECTIONS

The general proposed wiring connections are shown on the Engineer's drawings. This shows a typical diagram only, and the contractor shall develop his own diagram, along these guidelines.

a) Control

The cubicle door mounted pushbuttons, as well as the Hand / Off / Auto selector switch shall be wired directly into the IMPR. The emergency stop shall interrupt the normally closed stop circuit on the IMPR and shall also disconnect the power supply to the contactor coil.

All indicator lights must be wired straight out of the IMPR via the control voltage. Where more indicator lights are required than outputs are available on the IMPR, the contractor shall provide additional relays for these lights.

b) Power

The IMPR is intended for use by running the power conductors through the integral CT openings of the unit. Where the current of the drive is more than the rating of the integral CT's, the contractor shall provide secondary CT's to relay the current through the IMPR.

c) Inputs / Outputs

The unit shall as a minimum, have 6 digital inputs and 3 digital outputs.

ES 1.5.10.5 FUNCTIONS

The unit shall have the minimum of the following functions:

a) Measurement:
- Average line current
- Phase imbalance
- Thermal capacity level
- Frequency

b) Protection:
- Thermal overload
- Phase imbalance
- Phase loss
- Under / Over current
- Earth fault

c) Metering and Monitoring:
- Current
- Fault history

ES 1.5.10.6 PROGRAMMING

The IMPR shall have a removable user-machine interface (HMI). The contractor shall provide a single HMI per MCC, as well as one spare.

It shall be possible to set up all the parameters via the keypad on this HMI, and to view the various monitoring and metering units on the HMI screen.

It shall also be possible to program the unit from the PLC.

ES 1.5.10.7 COMMUNICATION

The unit shall have an open communications system, connected directly via RS485 or similar plug-in connectors, via a Modbus Plus network.

ES 1.5.10.8 PREFERRED SUPPLIERS

VSDs shall be ABB - Universal motor controller (UMC), WEG, Feedback Electronics or similar and equal approved

ES 1.6 DISTRIBUTION BOARDS & MAIN LV PANEL

ES 1.6.1 DISTRIBUTION BOARDS

The following distribution boards as described shall be equipped and installed in positions shown on the drawings or as directed by the Engineer. The distribution boards required are shown on the following drawings or as specified below:

a) DB01 – All Sewer Pump Stations, Blower Room, Chemical Dosing Room etc (4 Off)
Type: Surface 3CR12 with lockable door painted electric orange epoxy coated.

The DB shall be equipped as follows :
1 x 30Amp TP Main Switch and busbars
1 x 30Amp/30ma earth leakage relay for plug circuit
4 x 20Amp SP CB (plugs)
6 x 15Amp SP CB (lights)
1 x 5Amp SP CB (telemetry panel)
1 x 5Amp SP CB (photo cell)
1 x 5Amp SP CB (by-pass)
1 x 40 Amp TP CB with EL protection (welding plug)
2 x 10 Amp TP CB with 3 x 10Amp TP contactor with overload , start/stop push buttons and start/stop indication lights for extract fan circuits
2 x 20 Amp TP CB (spares
4 x 20 Amp SP CB (spares)

b) DB02 – Ex Guard House, Admin Building etc (Future)
Type: Surface 3CR12 with lockable door painted white epoxy coated

1 x 60Amp DP Main Switch and busbars
1 x 60Amp/30ma earth leakage relay for plug circuit
1 x 20Amp SP CB (plugs)
2 x 15Amp SP CB (lights)
1 x 5Amp SP CB (photo cell)
1 x 5Amp SP CB (by-pass)
2 x 20 Amp SP CB (spares)

The DBs shall be surface manufactured from 1,6mm 3CR12 sheeting with lockable door and epoxy powder coated and painted electric orange. The DBs shall be manufactured and supplied by **Pitt Switchboards** or similar and equal approved. Approval must be obtained before the tender closes. Legend cards to be provided.

PES 1.6.2 MAIN SITE LV DISTRIBUTION PANEL

The following distribution panel as described hereundershall be equipped and installed in positions shown on the drawings or as directed by the Engineer. The main LV distribution panel position and requirements is shown on the following drawings or as specified below:

1 x 300Amp Main Switch Isolator – 3 phase (Feed from Generator Control Panel)
Set 200Amp Busbars + Earth Bar
Set Surge Arresters
Voltmer and voltmeter selector switch
Ammeter, Fuses, CTs etc
Power-On Indication light
Circuit Breakers :

- 1 x 50Amp TP 3Ph – Feeder to MCC01
- 1 x 50Amp TP 3 Ph – Feeder to MCC02
- 1 x 50Amp TP 3 Ph – Feeder to MCC03
- 1 x 50Amp TP 3 Ph – Feeder to MCC04
- 1 x 20Amp TP 3 Ph – Feeder to 3 Phase streetlight circuit
- 1 x 20Amp SP 1 Ph – Feeder to 1 Phase streetlight circuit
- 1 x 50Amp TP 3 Ph – Spare Feeder
- 1 x 50Amp TP 3 Ph – Spare Feeder

- 1 x 50Amp TP 3 Ph – Spare Feeder
  1 x 50Amp TP 3 Ph – Spare Feeder

The distribution panel shall be surface manufactured from 1,6mm 3CR12 sheeting with lockable door and epoxy powder coated and painted electric orange. The DBs shall be manufactured and supplied by **Pitt Switchboards** or similar and equal approved. Approval must be obtained before the tender closes. Legend cards to be provided.

ES 1.7 CABLE RETICULATION SYSTEM

ES 1.7.1 GENERAL

The electrical contractor shall supply, deliver to site, lay in sleeves, ducts, manholes, lay in cable trenches excavated by himself, backfill the cable trench, connect up, test and commission the power and control cables.
A general description of the cables to be installed is tabled in the Cable Schedule elsewhere in this specification or as quantified.
Cable lengths shown on the schedule are approximate only. Actual lengths shall be physically measured on site before ordering of cables. Joints in cabling will not be permitted. Cables physically installed shall be claimed for payment. This applies to all other equipment.
Cable glands shall be CCG corrosion proof (Corrogland/Corruguard) or similar approved.
Plastic cable marker tape shall be placed 150 mm above cables during backfilling. Standard concrete cable markers shall be installed as indicated on the drawings all to SABS Specifications.

All power cabling shall be PVC/SWA/ECC/PVC, with copper conductors to SANS 1507. In instances cables shall embody an extra earth core as specified. Cables shall be buried at a depth of min 500mm. Power cable glands and shrouds shall comply with SANS 1213 type CCG or similar approved. Cables shall be full length point to point, no joints will be permitted.

All instrumentation cabling shall be multi strand copper braided cable or multi strand twisted pair cable Installed in a sleeve or fixed to cable tray.

Instrumentation cable glands and shrouds shall be type CCG, Pratley or similar approved brass compression or as approved by the Client or Engineer. Each cable end shall be labelled with a Bowthorpe Hellerman or similar type PK tag showing the cable details as indicated in the standard specification.

Cable tray and ladders shall be of the StrutAhead or similar approved pre-galvanised epoxy painted, medium duty tray supported on the wall by galvanised P2000 at intervals not exceeding one meter on the vertical or 750 mm on the horizontal, or P2000 cantilever arm if secured to the floor.
All trenches for low voltage and control cables are to be 600mm deep and 400mm wide.

Cable marking tape 150mm wide is to be installed at a depth of 300mm below ground line. All trenches must be inspected before they are backfilled. The trench must be back filled and compacted with a plate compactor in layers not exceeding150mm. Ducts must be installed complete with 1.6mm galvanised draw wire. Two ducts may be laid in the same trench at a minimum distance of 150mm apart. All bends must be the long radius type. No more than 500 metres of excavation may be left open at a time. Excavations may not be left open especially over the December / January builders shut down period.

Cable markers shall be LG Green or similar and are to be installed at distances not exceeding 10 meters and at every change of direction. Markers are to consist of a concrete block 100mm c 100mm x 300mm and installed in the vertical position. An aluminium plate 75 x 75mm is to be embedded in the concrete or secured to the top of the block by means of two ram set screws 25mm long. The plate is to be punched with numbers and arrows on smaller than 10mm.

Installed cabling shall be made vandal proof which includes encasing the cables in concrete by the civil contractor where specified.

ES 1.7.1.2 CABING TO MCCs, DBs AND EQUIPMENT

All pumps etc and other equipment shall be fed from the Motor Control Centre Panel MCC01 located in the MCC Room situated on top of the reservoir.

Cables will be located on cable ladders or trays for the pumps and instrumentation. Local isolators and stop buttons will be provided for local and emergency power isolation. All powered instruments and powered equipment, such as the level sensors, actuators, solenoid valves, vibrators, load cells, etc. will be supplied from the local distribution board located as part of the MCC panel.

Wires to lights, plugs, fans, aircon units etc. shall be wired in conduit. All electrical cables shall be PVC SWA PVC with integral ECC in accordance with SANS 1507 & SANS 10142. No separate earth conductor will be provided. Main power feeder cables shall be buried in the ground or in uPVC sleeves.

Surface cables and instrument cables shall be routed within buildings or structures.
Cable trays shall be hot dipped galvanised and adequately sized to suit the number of cables they carry.
Cables shall be suitably rated and sized for their anticipated loads and volt drop.

Refer to cable schedule and the drawings (where provided) for the new site electrical distribution system and cable reticulation. For other power cable requirements refer to the cable schedule in clause ES 1.6.1.3 below. The Engineer will direct the cable positions and routes where no drawing is available.

ES 1.7.1.3 INSTRUMENT CABLES

Instrumentation cables shall be 1,0mm² and 0,5mm² flexible stranded twisted copper wire for normal instrument signals and 1,5mm² or as scheduled in the cable schedules. All ethernet cables shall be CAT 6E industrial grade.

All terminations of cables will be terminated using appropriate termination glands with particular attention in any chemical dosing rooms where all equipment, cable terminations and connections being suitable for this EXE hazardous location.

ES 1.7.1.4 CABLE SCHEDULE

A cable schedule is tabulated below showing proposed cabling requirements between the MCC, PLC and related equipment. The following is a summary of cables required, but this shall not take away the responsibility from the contractor to provide and ensure all cables and wiring for a complete working and operational system.
Note that all cables are re-measurable and cables lengths shall be physically measured on site before ordering. The bill must not be used for ordering as actual cable lengths installed shall be claimed for payment.

The contractor shall be responsible to provide the correct size and rated cabling for each application to be measured on site. Cables shall be full length and jointed cables will not be permitted unless they are over a drum length. All lengths are re-measurable and payment will be made for actual lengths installed.

Note each operating / safety device is to be supplied with a separate cable to a IP65 CCG box or weatherproof isolator at the device. Multi-core cables run to two or more devices will not be acceptable.

a) All cables are to be numbered according to the standard specification.
b) Wiring colour codes must be adhered to in accordance with the standard specification.
c) All light and plug circuits are to be labelled in accordance with the standard specification.

The following minimum cables are required and as itemised in the schedule of quantities. The final cables selected shall suit the final motor sizes and capacities chosen for their appropriate loads or pumps.

CABLE SCHEDULE:

Cable Ref	Cable Destination		Cable Type Size and No.	Installation Method	Length (m)
	From	To			
ES 1.1.1.1 UNDERBERG-HIMEVILLE WWTW REFURBISHMENT					
E01	Mini-sub/Transformer meter	150kVA Stand-By Generator Change Over Panel	150 mm^2 x 4 Core ECC	Sleeves & ground	100
E02	Stand-By Generator Panel	Site Main LV Panel - A	150 mm^2 x 4 Core ECC	Sleeves & ground	50
E03	Site Main LV Panel - A	MCC01	25 mm^2 x 4 Core ECC	Sleeves & ground	120
E04	Site Main LV Panel - A	MCC02	25 mm^2 x 4 Core ECC	Sleeves & ground	150
E05	Site Main LV Panel - A	MCC03	25 mm^2 x 4 Core ECC	Sleeves & ground	180
E06	Site Main LV Panel - A	MCC04	25mm^2 x 4C ECC	Sleeves & ground	200
E07	MCC04	MCC05	10mm^2 x 4C ECC	Sleeves & ground	50
E08	Site Main LV Panel – A MCC04	3 Phase streetlight circuit	16mm^2 x 4C ECC	Sleeves & ground	250
E09	Streetlight junction box 3Ph	Streetlight 1 Ph	6mm^2 x 2C ECC	Sleeves & ground	150
E10	MCC01-05	e-stop locks	1,5mm^2 x 3C ECC	On cable tray/ducts	Varies
E11	MCC 01-05	Sewer Pumps no-flow switches	1.5mm² x 3C ECC	On cable tray/ducts	Varies
E12	MCC 01-05	Suction sump low level floats	1.5mm² x 4C ECC	On cable tray/ducts	Varies
E13	MCC 01-05	Suction sump ultrasonic level transmitters	1.5mm² x 4C ECC	On cable tray/ducts	Varies
E14	MCC 01-05	Flow meters & transmitters	1.5mm² x 4C ECC	On cable tray/ducts	Varies
E15	MCC 01-05	Reycle Pumps	6mm² x 3C ECC	On cable tray/ducts	Varies
E16	MCC03	RAS & Sludge Pumps	6mm² x 3C ECC	On cable tray/ducts	Varies
E17	MCC02	Blowers	10mm² x 3C ECC	On cable tray/ducts	Varies
E18	MCC03	Actuated valves (power)	2,5mm² x 3C ECC	On cable tray/ducts	Varies
E19	MCC03	Actuated valves (control)	1.5mm² x 12C ECC	On cable tray/ducts	Varies

Cable Ref	Cable Destination		Cable Type Size and No.	Installation Method	Length (m)
	From	To			
E20	MCC 01	Telemetry panel (future)	1.5mm² x 3C ECC	On cable tray/ducts	10
E21	MCC 01	Welding socket outlet	10mm² x 4C ECC	On cable tray/ducts	20
E22	MCC 01-05	DB-01 (4 No)	10mm² x 4C ECC	On cable trays/ducts	Varies
E23	Site Main LV Panel A	DB-02 (Guard House & Admin)	10mm² x 2C ECC	Ground & cable trays	Varies
C01	MCC01-05	All instruments	1,5mm² x 4 pair screened instrument cables	Ground & cable trays	Varies
C02	MCC01-05	All instruments	Decabond instrument cables	Ground & cable trays	Varies

NB. The cable numbering above is indicative and for tender purpose only. The contractor shall determine and provide the final cable schedule and numbering to suit. Although all the cables required may not be in the above schedule, there is sufficient cables measured in the bill of quantities to cover all the cable requirements.

Refer to the stand-by generator specifications and BOQ for the cable requirements for the gen-set.

The contractor shall determine the cable lengths and complete the above schedule with the correct lengths.

ES 1.8 STAND-BY GENERATORS

Currently a stand-by generator will be required for this project, and will form part of this contract. The details and specifications are found elsewhere in these documents. This must be taken into account in the design of the electrical systems and motor control panels.

ES 1.9 LIGHTING AND SMALL POWER SYSTEMS

Buildings:

All lighting and small power circuits shall be wired in PVC or galvanised conduit for all the new buildings or structures. Conduits for offices, control rooms etc shall be flush installed and cast in concrete floors, chased into internal faces of brickwork and installed inside ceiling spaces. Conduits for pump station and other industrial type buildings shall be surface mounted unless instructed otherwise by the Engineer. Isolators adjacent any plant equipment for motors shall be surface mounted and cabled from the MCC. All plugs, switches, sockets, isolators, etc. shall be Crabtree or similar and equal approved and to match existing. All electrical and associated equipment shall be SABS approved.
Exposed conduits shall be galvanized.

The installation shall be carried out as shown on the drawings or as directed by the Engineer on site where no drawings are available.
Light fittings shall be supplied and installed in positions as shown on the drawings and as quantified in the bill of quantities. Lights shall be similar to what is existing on site where applicable.

The following building will require new electrical installations:

- Inlet Works
- Truck Dumping Structure 1 & 2
- All Pump Rooms and Pump Stations (2 No)
- MCC Room
- Blower Room Building
- Chemical/Chlorine Dosing Building
- Second Class Water Building
- Existing Guard House, Existing Admin Building and Existing Old Un-used Building
- Any other Buildings

Lights and socket outlets shall be wired as follows:

- Lights: 2.5mm² including neutral & earth wires
- Sockets: 4 mm² including neutral & earth wires
- Welding Plugs: 16mm² x 4C cable

a) All light and plug circuits are to be labelled in accordance with the standard specification or as directed by the Engineer.
b) All work is to be carried out to SANS10142-1 latest amendment

The following luminaires as quantified in the schedule of quantities shall be installed in the various areas as follows: -

Pump Stations , Filter Building , Stores, Workshop, Sludge Building, Chemical Dosing Buildings etc	Type A	TLF- CRA - 2 LED Double 1.5m 2 Tube corrosion resistant fluorescent fittings with polycarbonate diffusers and LED energy efficient lamps
External Areas / Outside Fittings	Type B	TLF- LRBH-16W LED external bulkhead lights with LED lamps
External Areas	Type C	TLF - LFL-100W LED floodlight with 100Watt LED lamps or similar approved
Roads and General Areas	Type D	TLF- LSL/J-100Watt LED Nema Base -ECG streetlights with photo cell and with spigots/mounting arms etc
Streetlight Poles	Type E	Hot dipped steel streetlight pole – TLF-PL/JAL/7m – HM with lightning conductor on top, CB etc

Contact details for the above lighting supplier is The Lighting Factor (TLF) - Cell : 0836582489.

All work shall be carried out by qualified artisans and all work shall comply with latest versions of SANS 10142 and the Occupational Health and Safety Act and Regulation (OHS Act) . The certified person who is qualified shall issue the electrical compliance certificate (COC) .

Site Lighting:

New poles and streetlight fittings where required is to be installed as shown on drawing to be provided later or as directed on site by the Engineer.
The fittings and poles shall be similar to what existing on site where possible. The fittings required are industrial grade aluminium supplied by TLF 100W LED streetlight type TLF LSL/-J100Watt Nema Base-ECG with photo cell or similar and equal approved with high efficiency and improved reflector using latest lightning technology. It would be preferred if the existing fittings can be replaced with an equivalent LED luminaire. Poles shall be TLF PL/JAL/7m-HM 8m (7m mounting height) hot dipped galvanised steel type

complete lightning conductor, 5amp circuit breaker, photocell etc. Cable supplies shall be as shown on the cable schedule.

All internal building and site lighting where required shall suit the existing systems on site where they exist. New lighting shall be as supplied by The Lighting Factor (TLF) or similar and equal approved by the Employer's Representative. All lighting shall of local manufacture and carry the SABS mark of approval with spares and replacements readily available.
Contact details for The Lighting Factor (TLF) is Cell : 0836582489.

ES 1.10 LIGHTNING PROTECTION AND EARTHING SYSTEMS

The earthing system for the electrical panel and equipment shall be carried out in accordance with SANS10142 "Wiring of Premises" as amended. All exposed metal parts and equipment shall be bonded to the earthing system to ensure that any fault currents are diverted to earth without causing any harm or damage to personnel or equipment.

The sewer sumps and pump stations are situated on the site with the structures therein susceptible to damage from lightning strikes; therefore is proposed to install lightning protection systems for all new structures that have a metal or concrete roof over them.
The following structures and buildings require a lightning protection and earthing system to be installed :

- Inlet Works
- Truck Dumping Structure 1 & 2
- All Pump Rooms and Pump Stations (2 No)
- MCC Room
- Blower Room Building
- Chemical/Chlorine Dosing Building
- Second Class Water Building
- Any other Buildings

The new buildings, structures and pump stations shall be provided with a Lightning Protection system comprising of a 70mm² bare copper trench ring main around the building or structures and connected to a series of copper clad earth spikes driven in the ground, the quantity and spacings of which shall suit the ground resistivity survey and earth resistance required. All underground connections shall be exothermic welds and shall be Denso wrapped.
70mm² PVC insulated earth wires shall be connected from the trench earth and installed up brickwork or concrete walls and columns in conduit for connection to the reinforcing steel in concrete floors and to roof reinforcing and roof or intermediate structural members where installed. They shall be connected to steel trusses and steel sheeting where these are used as the roof covering. The roof terminal conductor will intercept any lightning strikes and safely divert these to the earthing system in the ground. The roof terminal conductor shall be 10 diameter solid aluminium earth conductor connected to the reinforcing steel of the roof slabs at least to all corners of the buildings or structures or as directed on site. All steel handrailing and platforms or staircases/catladders shall be bonded to the earthing system. Steel columns and other steel members shall be drilled and tapped to receive 70mm² terminations.

A 300mm long copper earth bar on standoff insulators shall be installed adjacent the MCCs in positions as shown the drawings or as directed on site. The lightning protection and earthing system shall be designed and installed by a specialist contractor in accordance with the requirements of SANS 10313, SANS 10199 and IEC62305. (latest amendments)
The new earth mats shall be connected to the existing earth systems (where existing) on site for equipotential bonding. All buildings or structures in close proximity to each other shall be cross-bonded together.
The lightning protection and earthing installation for the various structures and pump stations shall be undertaken as shown on the drawings where available. The Engineer will issue an instruction or direct the installation on site where no drawings are available. A sketch mark up may also be provided.

The test certificate and compliance certificate shall be issued for each building, pump station or structure by an accredited person and the installation earthing shall have a maximum resistance of 2 ohms and / or lower. Separate test and compliance certificates are required for each building or structure. Should this

figure not be achieved, then additional copper rods/trench earth must be installed to achieve an acceptable figure. The test certificates and compliance certificates shall be submitted to the Employer's Representative or Engineer and also be include in the O & M manuals and hand over data packs.

The Engineer shall be given at least two week's notice to inspect and witness the testing of the lighting protection and earthing system

Surge suppression equipment shall be installed in all MCC's and distribution boards.

All earth conductors are required to be hidden and built into surface beds, in floors, in concrete columns, in concrete walls and in brickwork. No chopping or chasing to install earth conductors will be allowed unless approved in writing by the Engineer.

ES 1.11 INSTRUMENTATION, SCADA & PLC SYSTEM

ES 1.11.1 GENERAL INSTRUMENTATION SPECIFICATIONS

All instrumentation and other equipment shall comply with the Industry Standard specifications such as IEC, BS, American or SANS standards.

Where the specifications contradict each other or where there are technical uncertainties, this project specification shall take precedence.
Full details and specifications with literature of all instrumentation equipment offered by the tenderers shall be submitted with the tender. The equipment offered shall comply with the requirements of the standard and detailed specifications.

ES 1.11.2 SCADA / MONITORING OF WORKS

A SCADA system for the works is currently not a requirement for this project, but could be incorporated at a later stage.

Please take this into account in the design of the MCC, controls and electrical installations.

ES 1.11.3 PLC (NOT REQUIRED)

PLC & HMIs for the MCCs in currently not a requirement for this project, but could be incorporated at a later stage.

Please take this into account in the design of the MCC, controls and electrical installations.

ES 1.11.4 TELEMETRY, SECURITY AND INTRUDER ALARM

1. **GSM TELEMETRY**
   Telemetry systems are currently not a requirement for this project, but could be incorporated at a later stage.

   Please take this into account in the design of the MCC, controls and electrical installations.

2. **SECURITY & INTRUDER ALARM**

A PIR motion detector sensor shall be installed in each pump room or MCC room and wired back to a control and monitoring system in the Admin Building.
A siren with strobe lights shall be installed outside the pump room or MCC room and be activated when the PIR sensor is activated.
The intruder alarm system to include all control panels, keypad etc as required.

All wiring shall be installed in PVC conduit and neatly installed.

The alarm signals and alerts shall be sent via hard wired cabling and via GSM to the relevant personnel at the Client's office PCs or smartphones.

The above installation is to be undertaken by the specialist security contractor.

ES 1.11.5 PARTICULAR SPECIFICATION FOR ULTRASONIC LEVEL TRANSMITTERS & INSTRUMENTS

The contractor is to ensure that the correct level sensors has been selected before the tender closes and priced accordingly. The below specifications is to be confirmed by the level sensor supplier to ensure that it is correct for the application.

The following level transmitters and their positions are required on this project:

Instrument Ref No	Item	Sensor Location	Description/Principle	Quantity	Function	Transmitter Location	PLC/ SCADA	Drawing No.
IN-A14-LV-001	Level sensor 1	Truck Dumping Structure 1 (Sump)	Flow Measurement %/m	1	Level monitoring, Control	MCC01	Future	N/A
IN-A14-LV-002	Level sensor 2	Truck Dumping Structure 2 (Sump)	Flow measurement %/m	1	Level monitoring, control	MCC01	Future	N/A
IN-A14-LV-003	Level sensor 3	Recycle Pump Station - Sump	Flow measurement %/m	1	Level monitoring, control	MCC03	Future	N/A
IN-A14-LV-004	Level sensor 4	Sludge & RAS Pump Station - Sump	Flow measurement %/m	1	Level monitoring, control	MCC04	Future	N/A
IN-A14-LV-005	Level sensor 5	Aerator Basin - Sump	Flow measurement %/m	1	Level monitoring, control	MCC02	Future	N/A
IN-A14-LV-006 & 007	Level sensor 6 - 7	Second Class Water Tanks 1 - 2	Flow measurement %/m	1	Level monitoring, control	MCC01	Future	N/A
IN-A14-LV-008	Level sensor 8	Inlet Works Channel	Flow measurement %/m	1	Level monitoring, control	MCC01	Future	N/A

SPECIFICATION FOR LEVEL TRANSMITTERS & INSTRUMENTS

Level sensors shall be IFM type UIT507 (0-10m suitable for sewer applications) or similar approved ultrasonic diffuse reflection sensor; M30 x 1.5 / L = 118.8 mm; Sensing range 600...8000; (Target: 1000 x 1000 mm); normally open / normally closed;
(parameterizable + 1x current output); analogue; DC PNP; M12 Connector; IP 67; Ambient temperature -20...70 °C,
The sensors shall be provided with mounting brackets type IFM E10737 Angle bracket.
Sensor cable shall be type IFM EVC087 or similar approved connecting cable with socket 20m;
Operating voltage < 250 V AC.
PUR; housing materials housing: TPU orange; Sealing: FKM; IP 65; IP 67; IP 68; IP 69K; Free from silicone; Halogen-free; Gold-plated contacts.

Separate level digital displays shall be installed in a separate indicator panel as specified elsewhere and is to be priced as part of the indicator panel.

The transmitters shall be installed inside the relevant MCCs (motor control centres) or in a separate panel/s with a viewing window adjacent the MCC, refer to the schematic single line diagrams of the motor control centres and distribution boards or as directed on site by the Engineer.

ES 1.11.6 MAG FLOW METERS (raw sewage)

The contractor is to ensure that the correct mag flow meter has been selected before the tender closes and priced accordingly. The below specifications is to be confirmed by the flow meter supplier to ensure that it is correct for the application.

Outdoor type IP67 rated in-line mag flow meters suitable for raw sewage are required as follows :

Instrument Ref No	Item	Instrument Location	Description/ Principle	Quantity	Pipe diameter (mm)	Function	PLC/ SCADA
FM-001	Flow meter – 1 DN 50	Rising main from Recycle Pumps to HOW	In-Line Electronic/flow	1	DN 50	Remote flow monitoring + local	Future
FM-002	Flow meter – 2 DN 50	Rising main from Second Class Water Pumps	In-Line Electronic/flow	1	DN 50	Remote flow monitoring + local	Future
FM-003	Flow meter – 3 DN 100	Rising main from Sludge Pumps	In-Line Electronic/flow	1	DN 100	Remote flow monitoring + local	Future
FM-004	Flow meter – 4 DN 100	Rising main RAS Pumps	In-Line Electronic/flow	1	DN 100	Remote flow monitoring + local	Future
FM-005	Flow meter – 5 Open Channel	Rising main RAS Pumps	In-Line Electronic/flow	1	Inlet HOW Open Channel	Remote flow monitoring + local	Future

The mag or ultrasonic flow meters shall be set, connections checked, tested and commissioned on site by the supplier of the meter. All test and connections diagrams to be verified and confirmed. The test reports and diagrams shall be submitted on commissioning of the meters and included in the O & M manuals.

ES 1.11.7 Electromagnetic flowmeter for DN50 to DN100 completely filled pipelines suitable for raw sewage

Krohne Optiflu x 2100W DN50 to DN 100 - PN16 or Similar (For Raw Sewage)

For completely filled pipelines with "pulsed DC field" measuring system. Measurement is unaffected by pressure, density, viscosity, conductivity (> 20 µS/cm), direction of flow and consistency of liquid. Suitable for the exact flow measurement of water, wastewater, sludge, thick sludge and additives.
Wet calibration using a certified test stand in accordance with
EN 17025 and EN 29104 (test stand is 3 times more accurate than the device under test).
Length of the sensor as per DIN and/or ISO 13359. Fully welded steel-plated coil housing, protective paint.
Up to 20 hours of factory sensor function/quality control in climatic exposure test cabinet.
Featuring diagnostics function according to VDI/VDE, i. e. automatic monitoring of operating condition of complete device, installation conditions and medium.

• Including calibration certificate
• Includes idling detection
- Type of medium for flow measurement - Raw Sewage
- Bi-directional flow measurement
- Including standard diagnostic functions:
  - Conductivity measurementt
  - Detection of electrode deposits/corrosion
  - Temperature display

- Detection of gas bubbles/solids

- Measuring tube liner: Hard rubber (as per KTW as well as DVGW W270 recommendations)
- Process temperature: -5…80°C I 23…176°F
- Nominal size DN 50 to DN100 = Pressure stage PN 16
- Measuring electrodes: Hastelloy C
- Flange material: polyurethane-coated carbon steel
- Signal output/communication: 1 x 4...20 mA, Impulse/frequency output, status output, galvanically separate
- Measuring accuracy: ±0.3 % of measured value ±1 mm/s
- Display LCD 3-line for flow and counting in physical sizes, keyboard operation
- Ex approval: None
- Grounding / earthing rings: incl. 1 full set grounding rings made of stainless steel 1.4404/316L
- Auxiliary power: 200-260 V AC
- Design: Separate design, Die-cast aluminium wall-mount housing
- Cable connection: M20 x 1.5
- Sensor cable/converter: 30m cables
- Protection class: as per EN 60529, sensor IP 67 | NEMA 6 and converter IP 66/67 | NEMA 4/4X/6, aluminium connection box

Manufacturer/Type: a) KROHNE OPTIFLUX 2100 W DN50 to DN100 or similar and equal approved suitable for raw sewage applications.

The flow meters will be installed in meter chambers to be constructed by the civil contractor. Transmitters are to be installed in their respective MCCs.

Full technical details of the flow meters shall be provided and submitted with the tender for evaluation purposes. Full QCP documentation is to be provided for approval prior to ordering of the units.

ES 1.11.8 UPS & UPS DB

ES 1.11.8.1 UPS

Not required.

ES 1.11.8.2 UPS DB 01

Not required.

ES 1.12 DIGITAL INSTRUMENT PANEL – DIP 01 (NOT REQUIRED)

Not required.

ES 1.13 OTHER INSTRUMENTATION

Pump Casing Temperature Transducer (Supplied with Pump)

Grundfos Tempcon, IMF or other approved motor PT100 thermistors (one per phase) including their corresponding controllers shall be supplied with pumps above 7,5kW where specified. The installation of the controllers and wiring in the MCC shall be undertaken by the electrical contractor.

No Flow Switch

Where specified, an IMF electronic (or equal and equal approved) no flow switch shall also be installed on the delivery line of the discharge of the pumps for pump no-flow and dry run protection. IMF switches are preferred. An ½ inch BSP socket shall be welded on the pipework for this. The controller shall be installed and wired in the MCCs for the no flow protection. These

switches shall be used for clear water pumps. IMF flow switches are preferred.

Paddle type no-flow switches shall be used for dirty raw water or de-sludge water pumping systems.

a) **Pressure transmitters, transducers or switches**

Pressure transmitters or pressure switches shall be as supplied by IFM with following specifications :

- Type ; IFM
- Application ; raw sewage
- Standards - DIN EN 60068-2-27 ; IEC60770; IEC61140; IEC61298
- Stainless steel
- IP rating ; IP68
- Vibration resistant
- Overload protection ;fast response time
- Fitting ; ½ inch BSP socket
- Output signal ; 4–20mA, 0–10V, 2–10V
- Transmitters and controllers are to be installed in their respective MCCs.

b) Low Level Cut-Out Switch

Low level float switches for pump dry run protection shall be as supplied by AC/DC and must switch the pump circuit to stop the pumps in the event that the level in the sump or reservoirs reaches a low level.
The floats must be suspended and fixed on suitably sized stainless-steel chain with a weight at the bottom of the chain. A CCG type junction box shall be installed adjacent the floats or electrodes for termination of the cables from the MCC.

Where specified, level electrodes shall be used for the low level cut out of the Pumps where the sludge content in the water is high.

Openings is the roof shall be provided by the civil contractor. A suitable HDG cover with vandal proof locks shall be installed over the floats or electrodes.

c) Electric Actuated Valves

All electric valve actuators shall be as supplied by Auma (Aumanat)

The following valve actuators are required :

i) V1 – 50 Dia electrically actuated valve on pipeline between Tanker Dumping Structure 1 and Tanker Dumping Structure 2 – Open by manual push buttons. Timer (adjustable) to allow the actuator to stay open for a preset time and close (say 10min) before closing
ii) V2 – 50 Dia electrically actuated valve on pipeline to second screen chamber in Tanker Dumping Structure 2 – Open and close by level indicator in sewage holding tank (with adjustable timers on both closing and opening)
iii) V3 - 100 Dia electrically actuated valve on pipeline between holdimg tank and sludge pumps in Tanker Dumping Structure 2 – Open and close by level indicator in sewage holding tank (with adjustable timers on both closing and opening)

The actuators shall conform to the following requirements and specifications:

- Standards – EN15714-2 ; IEC60034 ; IEC60529
- IP Rating – IP67 (Min – IP86 preferred); NEMA 4X/6: Corrosion-resistant, suitable for outdoor use
- Purpose – Gate Valve Actuator – Open/Close (no modulating)
- Application – Raw sewage
- Torque and thrust requirements – to be determined by manufacturer/supplier (submit

with tender)

- Materials - to be determined by manufacturer/supplier (submit with tender)
- Motor integral with actuator
- Hand wheel for local and emergency operation
- Power supply - 24V DC, 110V AC, 230V AC, or 400V AC.
- Frequency: 50/60 Hz.
- On/Off – Open/Close service (No modulating control).
- Input signals: 4–20mA, 0–10V, 2–10V.
- Remote position indication – valve open/close/fault-trip/selector switch
- Feedback: Limit switches, potentiometers, hall encoders.
- Local control units and battery backup fail-safe options.
- Integral and fitted with HDG spindle
- Full technical details, brochures and specifications to be submitted with tender.

Full details, specifications and technical brochures of all instruments and control systems shall be submitted with the tender for all level sensors, flow meters, actuated valves, pressure transmitters etc complete.

Full QCPs and data sheets of all equipment shall be submitted to the Engineer for approval prior to ordering of such equipment.

ES 1.14 VENTILATION SYSTEM

Where specified and required, wall or roof mounted Luft or similar and equal approved extract fans shall be installed extracting the air from the MCC Room to the outside air. These fans shall be switched via the starter contactors and push buttons in the MCC or DB.
Electrical isolators shall be provided adjacent the fan units.

Fans required in the abstraction pump station are Luft type LPA500/43F - 1350RPM 380/50 0,37kW 1,3Amps with Luft WC500 external wall cowl.

The specification of the fans can be found in the bill of quantities.

Air intake louvres or grilles required in brickwall or roof sheeting etc shall be provided by the civil contractor where required.

Openings for fans in brickwork and roof or side sheeting shall be provided by the civil contractor including any weather louvres or grilles etc. Mounding frames and flashing for fans in roof sheeting or side cladding shall be provided by the contractor.

ES 1.15 FIRE PROTECTION

The fire protection installation shall comprise of the following:

- Portable handheld fire extinguishers of 9kg dry chemical power and 5kg CO2 extinguishers installed in plant rooms or pump stations.
- All associated statutory signage for the above hose reels and extinguishers. Signage shall be rivetted or screwed to walls or doors.

All fire water pipes where required shall be hot dipped galvanized screwed pipes. The pipes shall be painted fire water red with primer coats. Painting shall be carried out in accordance with the manufacturer's instructions.

The installation shall be carried out as shown on the drawings or as directed by the Engineer where no drawing exists.
The fire protection installation shall be carried out in accordance with SANS10400 Part T & Part W.

ES 1.16 SIGNAGE

Signage inside and on the outside of the door to the pump stations or other buildings shall be provided in compliance with OHS Act (85 of 1995) and SANS 10142-1. In addition, a sign with the designation of the relevant pump station shall be fixed above the pump station door. A sign installed on the outside of the door shall read “UNAUTHORISED ENTRY NOT PERMITTED or NO UN-AUTHORISED ENTRY, ”

Standard off the shelf “WARNING ELECTRICITY DANGER” signs & “MACHINE STARTS AUTOMATICALLY DANGER” signs shall be installed at all pump stations and other buildings as indicated by the Engineer.

A label no smaller than 80mm high shall be mounted adjacent to each pump to identify it as a “PUMP 1 or “PUMP 2” etc. Number plate type signage is required adjacent each pump.

ES 1.17 ELECTRIC MOTORS

All LV electric motors shall comply with the requirements of IEC/SANS60034 and SANS1948 and as per the Standard Specifications or as specified under the mechanical specification for pumps or other mechanical plant.

Motors above 5 kW shall be premium efficiency IE3 specifications.

Motors above 5 kW shall be fitted with anti-condensate heaters. Motors above 5 kW shall be fitted with thermistors, one per phase.

Where required or specified, motors shall be fitted with DE & NDE bearing vibration and bearing temperature sensors. These requirements will be specified under the pumping or mechanical plant specifications.

Were required, motors shall be wired for DOL, VSD or soft starter operation as specified (refer to electrical; MCC specifications for details)

ES 1.18 TESTING

ES 1.18.1 General

The contractor shall provide all equipment for testing purposes and arrange for the Employer’s Representative or Engineer to witness such tests.
No test will be recognised unless it is documented in an agreed format. The test procedure shall ensure that every combination of switches and events is tested for correct functioning and each such combination will be on the test sheet and checked off.
The contractor shall supply all test equipment and consumables.
The contractor shall conduct tests at the following stages. The Employer’s Representative or Engineer shall be advised of the tests two weeks in advance of the test dates.

a) At manufacturers works before equipment is released to site
b) During installation where testing is necessary before final connections are made.
c) After installation is complete. This is to be witnessed by the Employer’s Representative.

At each stage tests shall be carried out by the contractor and a typed report submitted to the Employer’s Representative or Engineer. After submission of the test report, the Employer’s Representative or Engineer may call for all or some of the tests to be repeated in his presence.
Should any test be unsatisfactory at this time, the Employer’s Representative or Engineer reserves the right to have his reasonable abortive costs deducted from the contract sum.
The pump and civil contractor shall be in attendance when the pumps and pipework or other equipment is tested and commissioned.

ES 1.18.2 Workshop Tests

The Employer’s Representative or Engineer shall be granted the opportunity of inspecting progress at the manufacturer’s works.
The motor control centre or DBs shall be erected in the workshop complete with PLC, level, controls, instrumentation etc. and operation shall be proved by simulation of operating conditions.
Motor Control Centres

Inspections are required when the motor control centre metal work is complete but unpainted, after 80% of the components have been installed and wired and on final completion.
On final completion the following factory acceptance tests (FAT) shall be carried out in addition to any tests that the contractor or Engineer may wish to carry out.

1. Insulation resistance of busbars and wiring shall be measured at 500 volts DC using a hand-cranked megger.

2. Busbars shall be pressure tested at 2 000 volts AC for 10 minutes.

3. Small wiring shall be pressure tested at 2 000 volts AC after disconnection of voltage sensitive devices.

4. Functional and simulation tests of control and interlocking circuits shall be carried out.

5. Operation of current transformer driven equipment shall be proved by primary current injection. The current transformer ratio and polarity shall be checked.

6. Indicating instruments shall be checked at the normal operating point and calibrated against an instrument of certified accuracy. Adjusting screws shall be sealed by means of paint.

7. Test instrumentation used, the calibrating authority and calibration date shall be recorded.

8. The test results shall be recorded in the agreed format and submitted to the Employer's Representative for approval.

The equipment may not be released to site before the test report has been approved by the Employer's Representative or Engineer.

ES 1.18.3 Site Tests

The following site acceptance tests (SAT) shall be carried out in addition to any tests that the contractor may wish to carry out or other tests required by the Engineer.

Motor Control Centres

All tests carried out at the manufacturer's works shall be repeated on site and the test report endorsed accordingly.

Cables

The insulation resistance of power and control cables shall be measured at 500 volts DC using a hand cranked megger and the result recorded.
The insulation resistance shall be measured between each core and all other cores plus armouring and between armouring and earth.
The earth loop impedance of each cable shall be measured after glanding off and bolting into place but before connection. A null-balance megger shall be used, and the result recorded.

Instrumentation

Each instrument loop shall be calibrated by simulation of the measured quantity at 20%, 50%, 80% and 100% of the range.
Calibration shall be carried out in accordance with manufacturer's instructions or in a manner to be agreed with the Employer's Representative in the absence of such instructions.
An ohmmeter shall be used to measure resistance of instrument cable loops and resistance from each core to all other cores plus earth and/or screen. The results shall be recorded.

ES 1.18.4 PLC Process and Tests (NOT REQUIRED)

Refer to the standard electrical specifications for the PLC specification testing procedures.

ES 1.18.4.1 Project Flow (PF)

a) Propose and develop control philosophy (consult with Client and Engineer)
b) Review above philosophy
c) Raise queries with Client or Engineer
d) Receive final control philosophy from Client and Engineer
e) PLC Quality Control and FDS, Processes and Procedures (where required)
f) Program PLC (where required)
g) Create HMI Screens (where required)
h) Send HMI screens for approval (where required)
i) Review and finalise screens with Client and Engineer
j) Factory acceptance test
k) Site acceptance test

ES 1.18.4.2 Factory Acceptance Test (FAT)

a) Visual inspection to confirm that the drawing matches the physical panel.
b) Input & output testing (Confirm correct wiring to and from PLC or other control systems)
c) Verify HMI signals correspond to item 1 (where required)
d) Verify telemetry signals (where required)
e) Operating and control philosophy
f) All external signals to be simulated

ES 1.18.4.3 Site Acceptance Test (SAT)

a) Input & output testing of field wiring and marshalling
b) Test all signals as per FAT

ES 1.18.4.4 Site Reticulation

All tests specified in SANS 10142-1 shall be carried out on all circuits connected to the MCC and sub distribution board.

ES 1.19 Certificate of Compliance of Electrical Installation and Motor Control Centres

a) A separate certificate of compliance is required for each complete electrical installation, building or structure in addition to each DB or MCC.
b) A certificate of compliance, type testing and compliance with SANS 1014-2 for each motor control centre is required from the contractor.

ES 1.20 COMMISSIONING

Commissioning shall proceed in accordance with a previously agreed procedure which shall be documented, and which shall form the basis of the commissioning report.

During commissioning the operating parameters of each piece of equipment and each device shall be established and recorded at no-load, average and full load conditions.

The final set-points of all adjustable devices shall be recorded.

Full details of the commissioning procedures for the entire plant as a whole is specified elsewhere in this contract document. Where no commissioning plan is available, the contractor shall submit same to the Engineer for comments and approval

ES 1.21 SLEEVES & MANHOLES

The electrical contractor shall be responsible to supply and install cable sleeves in positions shown on the drawings under in ground trenches, roadways or through buildings and chamber walls. The sleeve requirements are shown on drawing number and on the individual building or pump station drawings. Where no drawing exists, the Engineer will

The manholes and covers as shown on the above drawings shall be supplied and built by the main civil or building contractor. The electrical contractor shall assist to co-ordinate the manhole construction in conjunction with the placing of the sleeves.

ES 1.22 EARTHING THE COMPLETE INSTALLATION

Supply, install and connect up and effectively earth the complete installation in accordance with the relevant clauses of the Standard Technical Specification contained herein together with the South African Bureau of Standards SANS10142-1 “Code of Practice for the Wiring of Premises” and the earthing regulations of the relevant supply authority.

Earthing of the buildings must meet the requirements of SANS 10313 as amended and SABS/IEC 61024 as amended. The main earth from the Supply Authority must not be relied upon as an effective ground earth.

The testing of the earthing and lightning protection systems must be witnessed by the Clients representatives and the Engineer.

ES 1.23 CONTRACTOR TO DESIGN AND ENGINEER

It is the contractor’s responsibility to design and engineer the motor control centre power and control circuitry installation in accordance with the specification and good engineering practice.
The design shall be undertaken by personnel who are able to demonstrate qualifications and experience in the field of water treatment and pumping plant including control systems and telemetry. The Contractor shall approve and sign design drawings and as-built drawings.
The Client’s Employer’s Representative or Engineer will review all drawings for conformance with the design concept but will not confer formal approval for construction.

ES 1.24 PREFERRED EQUIPMENT

ES 1.24.1 General

The tenderer shall base his main tender price on the equipment listed and as specified elsewhere in this specification.

The tenderer may however offer alternative equipment, but in this event:

a) It shall be offered in a covering letter as an add or an omit to the main tender price.
b) He shall submit sufficient documentation at the time of tender to allow the Client or Employer’s Representative to evaluate the equipment.
c) He shall make himself available during the tender adjudication period for one or more discussions on the detail of the equipment and its operation in a system.
d) The decision as to final choice of equipment shall rest with the Client or Employer’s Representative but this shall not relieve the contractor of his contractual obligations in terms of the specification.
e) All alternatives shall be approved by the Employer’s Representative or Engineer prior to the tenders closing.

ES 1.25 ELECTRICAL PANEL AND CIRCUIT DIAGRAMS

Complete control panel layouts, distribution boards layouts, circuit diagrams and wiring diagrams indicating clearly the proposed method of wiring shall be furnished. Panel layouts shall show dimensions and complete schedule of equipment together with full description, type, manufacturer, code, reference number, rating etc.

of all electrical equipment and components. No variation from such diagrams as submitted or as subsequently modified to meet the requirements of the Employer's Representative or Engineer, will be permitted without the prior approval in writing of the Employer's Representative or Engineer. Layouts and wiring diagram/components shall be approved by the Employer's Representative or Engineer prior to manufacture of the panels, all in accordance with the Standard Technical Specification. PLC I/O diagrams and I/O lists shall be included in the drawings and wiring diagrams.

On completion of the internal wiring to be carried out under this Section of the Contract, complete circuit diagrams indicating the wiring "as executed" shall be supplied to the Employer's Representative or Engineer prior to the issue of the Certificate of Completion.
The drawings shall be included in the operating and maintenance manuals to be supplied under the electrical and mechanical section. Three copies of the full plant operating and maintenance instructions for the mechanical process and electrical equipment shall be supplied.

ES 1.26 SPARE PARTS: ELECTRICAL

Tenderers shall allow for the supply and delivery of spares for the electrical equipment which they consider should be held in stores, but in any case, they shall include for the supply of one complete set of contacts for each type of starter and similarly for completed sets of operating coils. The electrical spares allowed for shall be described in the Annexures or on a separate schedule and submitted with the tender.

ES 1.27 PAINTING OF PANELS

Where sheet metal is used, the whole of the metal work is to be treated against corrosion with an approved rust removal inhibitor, then a primer and finally finished with two coats of an approved paint of selected colour all in accordance with the Standard Technical Specification.

ES 1.28 THE COMPLETE INSTALLATION

The meaning and intent of this electrical specification is that at the completion of the Contract, the Client shall be provided with a finished installation, complete in all respects, tested and passed as ready for use.

ES 1.29 HAND OVER, O & M MANUALS AND DATA PACKS

The contractor shall supply and deliver to the Clients Representative or Engineer and Client 5 hard copies and 4 soft copies of the O & M manuals and data packs on successful testing and commissioning of the complete electrical, mechanical, process and instrumentation installations for the project made up as follows as a minimum:

- Electrical COC's (one for each MCC, DB and for each building or structure)
- Earth test certificates
- As built DB and MCC layouts and wiring diagrams
- As built motor control panel layouts and wiring diagrams including component lists
- MCC quality control and test reports
- Factory routine test certificates (SANS1473-1)
- Partial type test certificates for MCC over 10Ka
- MCC paint thickness certificate
- FAT & SAT inspection and test reports
- Instrumentation equipment and details (flow meters, actuators, solenoid valves etc complete)
- Programmable and manual parameters of all electronic and instrumentation equipment
- Instrumentation and electrical devise settings and set-points
- As built FDS (control functional design specification and operational specification)
- Cable specifications and cable schedule
- PLC, HMI and telemetry specifications
- PLC and HMI program
- Process control network diagrams
- PLC, HMI and telemetry wiring diagrams
- Telemetry equipment and layout drawings and diagrams
- All equipment specifications and literature with brochures including cables, lights etc

- Cable block diagrams
- Instrument loop and block diagrams
- Specifications and details of all electrical equipment used on the project including literature and brochures. To include transformers, LV & MV equipment etc.
- Details of all pumping plant, valves, pumps, motors and other mechanical equipment used on the project
- Details of all chemical dosing pumps and other equipment
- Details of all instruments used on the project (flow meters, level sensors, level floats, flow switches, pressure switches etc)
- Details of all dosing pumps and other equipment used on the project
- All maintenance and servicing schedules of all electrical, instrumentation and mechanical equipment
- The operating and maintenance instructions for all electrical, instrumentation and mechanical equipment, valves, pumps, motors etc
- OEM manuals of all mechanical, electrical and instrumentation equipment
- Fault finding procedures and instructions
- Supplier details of all major equipment
- QCPs of all equipment
- Calibration certificates of instruments and other equipment
- Guarantee certificates
- Pipework and plant drawings
- As built drawings and site and building cable schematics and layouts

Only items above that pertain to this project will apply.

Training:
Full training shall be provided to the Client's operations and maintenance staff on all the electrical, instrumentation and mechanical equipment pertaining to this project.

The details of the contract and details of the contractor and sub-contractors must be included in the manuals. The files must comprise an index with fly sheets.

The contractor shall submit draft copies of the manuals to the Engineer for comment and approval prior to compiling and submitting the final manuals. The manuals and documents must be available before the final commissioning and hand-over of the project to the Client.
The requirements and details for other equipment are found elsewhere in the tender documents and should be read in conjunction with this specification. The above are minimum requirements and the contractor shall submit all other documents deemed necessary for the operation and maintenance of the plant.

ES 1.30 GUARANTEE, FINAL INSPECTION, MAINTENANCE & HAND-OVER

A final inspection will be conducted jointly by the Employer's Representative or Engineer, the Contractor or the Main Contractor on satisfactory completion of all official tests. This inspection may be phased where a Contract is to be taken over in sections by arrangement with all parties concerned.
A list of defects, remedial or incomplete works requiring attention will be drawn up following this inspection and issued to the Contractor for his immediate attention.
Once the items listed have been attended to the satisfaction of the Employer's Representative or Engineer, the Contractor shall issue a certificate of compliance, thereafter a completion certificate will be issued by the Employer's Representative or Engineer.
The contractor shall arrange for the handover of the completed electrical and mechanical installations to the Employer's Representative or Engineer and Client on successful commissioning of the works.
The complete electrical and instrumentation system shall be guaranteed for a period of twelve months from the date of the practical completion system when the Client takes beneficial use of the equipment.
During the guarantee period the contractor shall maintain the electrical and pumping system where applicable for a period of twelve months. The maintenance shall include greasing of all bearings and moving parts, topping up of any fluids, checking for loose connections and tightening of terminals and bolts, measuring insulation resistance, checking for vibration and noise and general conditioning monitoring on all pumps, motors, valves etc. The contractor shall also check that all indicator lights are working, test earth leakage

units, test and check stop locks and all control circuitry and instrumentation or any other checks and tests that are required.

The project will not be signed off for payment and hand-over before all snags identified in the preliminary inspections are complete and a compliance certificate and test report is issued.

ES 1.31 SCHEDULE OF PREFERRED AND ACCEPTABLE EQUIPMENT

Schedule of recommended equipment. The tenderer may, however, offer alternatives but these shall be approved by the Engineer and Client prior to the tenders closing.

Soft starters	ABB or similar approved
Variable speed drives	Control Technologies C200 Commander series or similar approved
Circuit Breakers, ACB's	Merlin Gerin, ABB, CBI
Contactors, isolators, indication lamps	ABB, Telemecanique,
Relays, fuses, motor protection relay	Omron, ABB,Finder
Control switches, selector switches	Krause and Naimer, ABB, Telemecanique, Moeller
Electronic Motor Controller	ABB UMC22-FBP, Omron SEK
Ammeter, voltmeter, current transformer, operations counter, hour meter.	Hartmann and Braun
Cables, Wire	Aberdare
Cable trays, ladders , wire baskets, trunking	Strutahead
HRC fuses and holders	G.E.C.or similar
DC Power Supplies	Meanwell Ad-155B
Electrically operated solenoids	Festo, Asco, Burkert
Level Control	IFM, Siemens Milltronics Multiranger MR200 DP 6R, Siemens stainless steel echo max transducer brackets FMS310. Alternative Endress & Hauser units t be used.. IFM preferred.
Surge Arrestors	Dehnguard 275 and 1 No. DehnGap
Power supplies	Siemens / SITOP series
Relays, timers	Omron, ABB
Terminal relays	Weidmuller, Klippon, Phoenix Contact
Electrical motors	WEG, ABB , Siemens
Emergency stop stations, push buttons	Cutler Hammer, ABB or similar
Circuit breakers	ABB, CBI, Schneider, M&G
Fuse switches	ABB Stromberg or similar

Terminals	Klippon, Phoenix Contact
Cable glands	CCG Corrogland
Junction boxes	York enclosures or similar
Power monitor	Schneider, ABB, Rockwell
Open channel measurement flow meter	Siemens Milltronics Multiranger MR-200 DP 6R or similar
Radar level meter	Krohne, VEGA, Siemens
Magnetic flow meter	Safmag, Siemens, Krohne, Endress & Hauser
Other flow meters	Siemens, Fuji, Krohne, Endress & Hauser
Flow switches	IFM , EGE (electronic). IFM preferred
Pressure transmitter	Wika, Siemens
Differential pressure transmitter	Wika, Siemens
Analogue pressure gauges	Wika, Siemens
Chlorine gas leak detectors	Siemens, Grundfos
Residual chlorine meter	Siemens, Grundfos
Dissolved oxygen meter	Hach LDO type
Turbidity meter	Hach, Endress & Hauser
Temperature measurement	Wika, Siemens
Pressure gauges	Wika, Siemens
Air flow meters - Thermal resistance type	Endress & Hauser
Proximity switch	Efector (Shorrock Automation)
Solenoid operated valves	Bürket
Surge protection	Surgetek : BCT BE24 (signals) DEHNguard 275 (line) DEHNgap B (neutral) Phoenix Type TT-2-PE- 24VDC
Other surge protection	DehnVentil 255 - Mains
Loop splitters	Omniflex type LPI/LPS
UPS	APC
SCADA	Adroit , Schneider or similar approved
PLC	Schneider, Delta, Allen Bradley Compact Logix L1
HMI	Allen Bradley or Schneider Touch Screen

Industrial Ethernet network switch	Unmanaged - Hirschmann Managed - Hirschmann
Pneumatic actuators	Festo, Biman
Electrical Valve actuators	Aumanat or Rotork
Telemetry Unit	ISTAT M2X3 , Elpro, Motorolla , Scheider Scada Pack, SSE , Remote Monitoring & Control (RMC). RMC preferred.
Pipework Coating	Plascoat PPA 571 Aqua
Non-Shrink Grout	Pro-Struct 531-MCI
Switches, sockets outlets, isolators etc	Crabtree
Light luminaires/fittings	TLF - The Lighting Factor

Note : QCPs and technical specifications for all equipment is to be submitted to the Engineer for approval prior to ordering of any equipment.

COMPULSORY RETURNABLE DATA SHEETS

SCHEDULE 1 - TECHNICAL DATA SHEET: MCC01 – INLET WORKS

NAME OF SITE: _____

RATING OF MCC PANEL: _____

No	ITEM	SPECIFIED	OFFER
1	Manufacturer	To specify	
2	Floor/Wall Mounted	Yes	
3	Front & Side Access	Yes	
4	Form Type & kA rating	2b/4b (manufacturer to confirm)	
5	Material	1,6/2mm 3CR12	
6	Finish	Painted Electric Orange (epoxy coated)	
7	Cable Entry	Bottom	
8	Base	Hot dipped galvanised	
9	Doors	Lockable	
10	IP Rating	IP 54	
11	Electrical Details	400V, 50Hz, Full Neutral	
12	Earthing Details	Full Length	
13	Instrument Earth	Full Length	
14	Busbar Chamber	Top	
15	Grouping of Equipment	Individual	
16	Door Interlocks	Isolator Interlocks	
17	Panel tiers	Bolted together transportable sections -no more than 1.5m in length. Extensible and modular	
18	Dielectric Barriers	Yes	
19	Busbar Supports	Epoxy Insulators on Steel	
20	Compliance with detailed technical specification	Yes/No	
21	SANS Approved	Yes/No	
22	Busbar Material	Copper	
23	Mouldered Case Circuit Breakers	Schneider, ABB or similar	
24	Manufacturer	Yes/No	
25	In Accordance with Spec	Yes/No	
26	Main Circuit Breakers	Schneider, ABB or similar	
	Manufacturer	Yes/No	
	In Accordance with Spec	Yes/No	
24	Selector Switches	Unspecified	
	Manufacturer	Yes/No	
	Type	Rotary	
	In Accordance with Spec	Yes/No	

COMPULSORY RETURNABLE DATA SHEETS….. Continued

TECHNICAL DATA SHEET: MCC 01 – INLET WORKS

NAME OF SITE: _____

RATING OF MCC PANEL: _____

No	ITEM		SPECIFIED	OFFER
25	HRC /Semi-Conductor Fuses Fuses			
	Manufacturer	Unspecified		
	Type	Visible Link		
	In Accordance with Spec	Yes/No		
26	Contactors			
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
27	Variable Speed Drives-Low Harmonics	Yes/No		
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
28	Soft Starters	Yes/No		
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
29	Ancillary Relays			
	Manufacturer	Unspecified		
	Type	Plug-In		
	Field convertible contact configuration	Yes/No		
	In Accordance with Spec	Yes/No		
30	Push Buttons			
	Manufacturer	Unspecified		
	Type	As per spec		
	In Accordance with Spec	Yes/No		
31	Indicator Lamps			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
32	Emergency Stop Button			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
33	Automatic Change over Equipment			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
	Power Safe as per specs	Indicator Lamps		
34	Indicator lamps			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with specs	Yes/No		
35	Other Equipment			

NAME COMPANY: _____ SIGNATURE OF REP :_____

DATE_____

ANNEXURE B

COMPULSORY RETURNABLE DATA SHEETS

SCHEDULE 2 - TECHNICAL DATA SHEET: MCC02 - BLOWERS

NAME OF SITE: _____

RATING OF MCC PANEL: _____

No	ITEM	SPECIFIED	OFFER
1	Manufacturer	To specify	
2	Floor/Wall Mounted	Yes	
3	Front & Side Access	Yes	
4	Form Type & kA rating	2b/4b (manufacturer to confirm)	
5	Material	1,6/2mm 3CR12	
6	Finish	Painted Electric Orange (epoxy coated)	
7	Cable Entry	Bottom	
8	Base	Hot dipped galvanised	
9	Doors	Lockable	
10	IP Rating	IP 54	
11	Electrical Details	400V, 50Hz, Full Neutral	
12	Earthing Details	Full Length	
13	Instrument Earth	Full Length	
14	Busbar Chamber	Top	
15	Grouping of Equipment	Individual	
16	Door Interlocks	Isolator Interlocks	
17	Panel tiers	Bolted together transportable sections - no more than 1.5m in length. Extensible and modular	
18	Dielectric Barriers	Yes	
19	Busbar Supports	Epoxy Insulators on Steel	
20	Compliance with detailed technical specification	Yes/No	
21	SANS Approved	Yes/No	
22	Busbar Material	Copper	
23	Mouldered Case Circuit Breakers	Schneider, ABB or similar	
24	Manufacturer	Yes/No	
25	In Accordance with Spec	Yes/No	
26	Main Circuit Breakers	Schneider, ABB or similar	
	Manufacturer	Yes/No	
	In Accordance with Spec	Yes/No	
24	Selector Switches	Unspecified	
	Manufacturer	Yes/No	
	Type	Rotary	
	In Accordance with Spec	Yes/No	

COMPULSORY RETURNABLE DATA SHEETS….. Continued

TECHNICAL DATA SHEET: MCC02 - BLOWERS

NAME OF SITE: _____

RATING OF MCC PANEL: _____

No	ITEM		SPECIFIED	OFFER
25	HRC /Semi-Conductor Fuses Fuses			
	Manufacturer	Unspecified		
	Type	Visible Link		
	In Accordance with Spec	Yes/No		
26	Contactors			
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
27	Variable Speed Drives-Low Harmonics	Yes/No		
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
28	Soft Starters	Yes/No		
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
29	Ancillary Relays			
	Manufacturer	Unspecified		
	Type	Plug-In		
	Field convertible contact configuration	Yes/No		
	In Accordance with Spec	Yes/No		
30	Push Buttons			
	Manufacturer	Unspecified		
	Type	As per spec		
	In Accordance with Spec	Yes/No		
31	Indicator Lamps			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
32	Emergency Stop Button			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
33	Automatic Change over Equipment			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
	Power Safe as per specs	Indicator Lamps		
34	Indicator lamps			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with specs	Yes/No		
35	Other Equipment			

NAME COMPANY: _____ SIGNATURE OF REP :_____

DATE_____

COMPULSORY RETURNABLE DATA SHEETS

SCHEDULE 3 - TECHNICAL DATA SHEET: MCC03 – RECYCLE PUMPS

NAME OF SITE: _____

RATING OF MCC PANEL: _____

No	ITEM	SPECIFIED	OFFER
1	Manufacturer	To specify	
2	Floor/Wall Mounted	Yes	
3	Front & Side Access	Yes	
4	Form Type & kA rating	2b/4b (manufacturer to confirm)	
5	Material	1,6/2mm 3CR12	
6	Finish	Painted Electric Orange (epoxy coated)	
7	Cable Entry	Bottom	
8	Base	Hot dipped galvanised	
9	Doors	Lockable	
10	IP Rating	IP 54	
11	Electrical Details	400V, 50Hz, Full Neutral	
12	Earthing Details	Full Length	
13	Instrument Earth	Full Length	
14	Busbar Chamber	Top	
15	Grouping of Equipment	Individual	
16	Door Interlocks	Isolator Interlocks	
17	Panel tiers	Bolted together transportable sections -no more than 1.5m in length. Extensible and modular	
18	Dielectric Barriers	Yes	
19	Busbar Supports	Epoxy Insulators on Steel	
20	Compliance with detailed technical specification	Yes/No	
21	SANS Approved	Yes/No	
22	Busbar Material	Copper	
23	Mouldered Case Circuit Breakers	Schneider, ABB or similar	
24	Manufacturer	Yes/No	
25	In Accordance with Spec	Yes/No	
26	Main Circuit Breakers	Schneider, ABB or similar	
	Manufacturer	Yes/No	
	In Accordance with Spec	Yes/No	
24	Selector Switches	Unspecified	
	Manufacturer	Yes/No	
	Type	Rotary	
	In Accordance with Spec	Yes/No	

COMPULSORY RETURNABLE DATA SHEETS….. Continued

TECHNICAL DATA SHEET: MCC03 – RECYCLE PUMPS

NAME OF SITE: _____

RATING OF MCC PANEL: _____

No	ITEM		SPECIFIED	OFFER
25	HRC /Semi-Conductor Fuses Fuses			
	Manufacturer	Unspecified		
	Type	Visible Link		
	In Accordance with Spec	Yes/No		
26	Contactors			
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
27	Variable Speed Drives-Low Harmonics	Yes/No		
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
28	Soft Starters	Yes/No		
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
29	Ancillary Relays			
	Manufacturer	Unspecified		
	Type	Plug-In		
	Field convertible contact configuration	Yes/No		
	In Accordance with Spec	Yes/No		
30	Push Buttons			
	Manufacturer	Unspecified		
	Type	As per spec		
	In Accordance with Spec	Yes/No		
31	Indicator Lamps			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
32	Emergency Stop Button			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
33	Automatic Change over Equipment			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
	Power Safe as per specs	Indicator Lamps		
34	Indicator lamps			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with specs	Yes/No		
35	Other Equipment			

NAME COMPANY: _____ SIGNATURE OF REP :_____

DATE_____

COMPULSORY RETURNABLE DATA SHEETS

SCHEDULE 4 - TECHNICAL DATA SHEET: MCC04 – SLUDGE PUMPS & RAS PUMPS

NAME OF SITE: _____

RATING OF MCC PANEL: _____

No	ITEM	SPECIFIED	OFFER
1	Manufacturer	To specify	
2	Floor/Wall Mounted	Yes	
3	Front & Side Access	Yes	
4	Form Type & kA rating	2b/4b (manufacturer to confirm)	
5	Material	1,6/2mm 3CR12	
6	Finish	Painted Electric Orange (epoxy coated)	
7	Cable Entry	Bottom	
8	Base	Hot dipped galvanised	
9	Doors	Lockable	
10	IP Rating	IP 54	
11	Electrical Details	400V, 50Hz, Full Neutral	
12	Earthing Details	Full Length	
13	Instrument Earth	Full Length	
14	Busbar Chamber	Top	
15	Grouping of Equipment	Individual	
16	Door Interlocks	Isolator Interlocks	
17	Panel tiers	Bolted together transportable sections -no more than 1.5m in length. Extensible and modular	
18	Dielectric Barriers	Yes	
19	Busbar Supports	Epoxy Insulators on Steel	
20	Compliance with detailed technical specification	Yes/No	
21	SANS Approved	Yes/No	
22	Busbar Material	Copper	
23	Mouldered Case Circuit Breakers	Schneider, ABB or similar	
24	Manufacturer	Yes/No	
25	In Accordance with Spec	Yes/No	
26	Main Circuit Breakers	Schneider, ABB or similar	
	Manufacturer	Yes/No	
	In Accordance with Spec	Yes/No	
24	Selector Switches	Unspecified	
	Manufacturer	Yes/No	
	Type	Rotary	
	In Accordance with Spec	Yes/No	

COMPULSORY RETURNABLE DATA SHEETS….. Continued

TECHNICAL DATA SHEET: MCC04 – SLUDGE PUMPS & RAS PUMPS

NAME OF SITE: _____

RATING OF MCC PANEL: _____

No	ITEM		SPECIFIED	OFFER
25	HRC /Semi-Conductor Fuses			
	Manufacturer	Unspecified		
	Type	Visible Link		
	In Accordance with Spec	Yes/No		
26	Contactors			
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
27	Variable Speed Drives-Low Harmonics	Yes/No		
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
28	Soft Starters	Yes/No		
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
29	Ancillary Relays			
	Manufacturer	Unspecified		
	Type	Plug-In		
	Field convertible contact configuration	Yes/No		
	In Accordance with Spec	Yes/No		
30	Push Buttons			
	Manufacturer	Unspecified		
	Type	As per spec		
	In Accordance with Spec	Yes/No		
31	Indicator Lamps			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
32	Emergency Stop Button			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
33	Automatic Change over Equipment			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
	Power Safe as per specs	Indicator Lamps		
34	Indicator lamps			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with specs	Yes/No		
35	Other Equipment			

NAME COMPANY: _____ SIGNATURE OF REP :_____

DATE_____

COMPULSORY RETURNABLE DATA SHEETS

SCHEDULE 5 - TECHNICAL DATA SHEET: MCC05 – CHEMICAL / CHLORINE DOSING

NAME OF SITE: _____

RATING OF MCC PANEL: _____

No	ITEM	SPECIFIED	OFFER
1	Manufacturer	To specify	
2	Floor/Wall Mounted	Yes	
3	Front & Side Access	Yes	
4	Form Type & kA rating	2b/4b (manufacturer to confirm)	
5	Material	1,6/2mm 3CR12	
6	Finish	Painted Electric Orange (epoxy coated)	
7	Cable Entry	Bottom	
8	Base	Hot dipped galvanised	
9	Doors	Lockable	
10	IP Rating	IP 54	
11	Electrical Details	400V, 50Hz, Full Neutral	
12	Earthing Details	Full Length	
13	Instrument Earth	Full Length	
14	Busbar Chamber	Top	
15	Grouping of Equipment	Individual	
16	Door Interlocks	Isolator Interlocks	
17	Panel tiers	Bolted together transportable sections -no more than 1.5m in length. Extensible and modular	
18	Dielectric Barriers	Yes	
19	Busbar Supports	Epoxy Insulators on Steel	
20	Compliance with detailed technical specification	Yes/No	
21	SANS Approved	Yes/No	
22	Busbar Material	Copper	
23	Mouldered Case Circuit Breakers	Schneider, ABB or similar	
24	Manufacturer	Yes/No	
25	In Accordance with Spec	Yes/No	
26	Main Circuit Breakers	Schneider, ABB or similar	
	Manufacturer	Yes/No	
	In Accordance with Spec	Yes/No	
24	Selector Switches	Unspecified	
	Manufacturer	Yes/No	
	Type	Rotary	
	In Accordance with Spec	Yes/No	

COMPULSORY RETURNABLE DATA SHEETS….. Continued

TECHNICAL DATA SHEET: MCC05 – CHEMICAL / CHLORINE DOSING

NAME OF SITE: _____

RATING OF MCC PANEL: _____

No	ITEM		SPECIFIED	OFFER
25	HRC /Semi-Conductor Fuses			
	Manufacturer	Unspecified		
	Type	Visible Link		
	In Accordance with Spec	Yes/No		
26	Contactors			
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
27	Variable Speed Drives-Low Harmonics	Yes/No		
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
28	Soft Starters	Yes/No		
	Manufacturer	Unspecified		
	Type	AC3		
	In Accordance with Spec	Yes/No		
29	Ancillary Relays			
	Manufacturer	Unspecified		
	Type	Plug-In		
	Field convertible contact configuration	Yes/No		
	In Accordance with Spec	Yes/No		
30	Push Buttons			
	Manufacturer	Unspecified		
	Type	As per spec		
	In Accordance with Spec	Yes/No		
31	Indicator Lamps			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
32	Emergency Stop Button			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
33	Automatic Change over Equipment			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with Spec	Yes/No		
	Power Safe as per specs	Indicator Lamps		
34	Indicator lamps			
	Manufacturer	Unspecified		
	Type	As per specs		
	In Accordance with specs	Yes/No		
35	Other Equipment			

NAME COMPANY: _____ SIGNATURE OF REP :_____

DATE_____

PS SDG -STAND-BY DIESEL GENERATOR

PROJECT TECHNICAL SPECIFICATIONS

A. GENERAL

SDG.1.1 General

Supply, deliver, install, test, commission and maintain and service the emergency diesel generating set for the Underberg-Himeville WWTW Refurbishment Phase 0A Project in Underberg in the KZN Midlands. The gen-sets are for the refurbishment of the existing WWTW as follows :

- Underberg-Himeville WWTW (150kVA) – To be checked and confirmed by supplier prior to tender closing.

This installation must comply fully with all the sections of this specifications and drawings (where applicable) issued with this document. This technical Specification is supplementary to the Equipment Requirements, Section 2, the Standard General Specifications included with the tender and must be read together. Where they are at variance the Technical Specification shall apply.

These generator sets are to be fully enclosed and synchronised during operation.

The gen-set is to fully comply with the standard specifications for Stand-By Diesel Generators and the specifications of the **HARRY GWALA DISTRICT MUNICIPALITY** where applicable. These specifications are
to take precedence over all other specifications and is to be obtained directly from Municipality.

SDG.1.2 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.

a) Height above sea level : 1533 meter above sea level (Underberg , KZN Midlands)

b) Maximum ambient temperature : 45°C

c) Humidity : Up to 90% - high

SDG.1.3 Output and Voltage

After the de-rating factors for the engine and generator due to site conditions are taken into account, the sets must have a site output and voltage as follows:

No load voltage : 400/230 Volt
Rating of Gen-Set : 1 x 150kVA (estimated, final to be calculated and confirmed by supplier/manufacturer prior to tenders closing)
Generator motor : To be sized to suit motor size and load
Type of sewage pump staters : VSDs, star-delta & DOL starters
Frequency (Prime) : 50Hz
Fault Level : 15kA
Load Power Factor : 0.8

An alternative price for a 200kVA set is to provided also.

The generator build for the Underberg-Himeville WWTW Refurbishment – Phase 0A, shall be a silent type diesel engine close coupled to a brushless alternator, all on a fabricated steel base via anti-vibration mounts and mounted in a standard canopy manufactured of 3CR12 to suit the equipment sizes. Sound attenuation shall be provided for the set and the canopy as the unit will be adjacent a residential development and the noise levels shall be kept to minimum decibel values.
All fasteners, mounting accessories, bolts, nuts and washers is to be stainless steel. The unit is to be

corrosion resistant due to it being installed in a very corrosive atmosphere.

The diesel engine shall be a Deutz, John Deere, Volvo or Perkins (in order of preference) or similar and equal approved. The motor shall be water cooled, direct injection, four cylinder unit with electronic governor. The tenderer shall obtain prices for all the brands and the final decision as to which unit is to be used will be decided later depending on prices and availability. The Deutz or John Deere engine shall be quoted on.

The generator output shall suit the starting and run load as per the load estimates below. The estimates may change slightly depending on the selected pumps, mechanical equipment and motors. The load prime power shall be rated at 0.8PF; 400/230V; three phase four wire; 50Hz running at 1500RPM with an overload capacity of 10% per one hour in every 12 hour running cycle. The main load on the generator shall be the sewage pumps and blowers etc operated by VSD, DOL and star-delta starters, all internal and external lighting and power points. Where pumps are installed, no two or more pumps will be able start simultaneously, inter-locking in the MCC or PLC (where installed) will be provided to enable this function.

Table A-1 : Table of Estimated Load and Power Requirements for Underberg-Himeville WWTW – Phase 0A

Type of load	Quantity	Kw (Each)	Installed Load kW	Run Duty Load kW	Type of Starting	Approx Motor & Other Load Run Current (amps)	Start Current - Each (amps)
De-Gritter Pumps Sewer Pumps 1 - 2	2 (1 *duty - 1 stand*-by)	0,55	1,1	0,55	Soft Starter	1,0	4,0
Immersible sewage pumps	2 (1 *duty - 1 stand*-by)	0,75	1,5	0,75	VSD	1,5	1,5
Second class water pumps	2 (1 *duty - 1 stand*-by)	1,1	2,2	1,1	VSD	2,0	2,0
Electrical valve actuators	3 (1 *duty - 2 stand*-by)	0,75	2,25	0,75	DOL	1,5	4,5
Blowers	4 (2 *duty - 2 stand*-by)	5,5	22	11	Soft Starter	21 (x 2)	84
Recycle pumps	2 (1 *duty - 1 stand*-by)	5,5	11	5,5	VSD	11	11
Sludge/RAS pumps	4 (2 *duty - 2 stand*-by)	0,75	3	1,5	VSD	3,0	3,0
Dosing pumps	4 (2 *duty - 2 stand*-by)	0,75	3	1,5	DOL	3,0 (x 2)	6,0
Extract Fans 1 – 2	4 (4 *duty)*	0,75	3	3	DOL	1,4 (x 3)	8,4
SUB TOTAL			**49,05 kW**	**25,65 kW**			**124,40 Amps**
Site Lighting, Lighting & Small Power	1	10	10	10			
Instruments / Flow Meters etc	20	0,55	11	11			
Other Minor Loads, AC units etc	1	10,48	10,89	2,47			
Welding	4	6	24	0			
Total kW			**104,94 kW**	**49,12 kW**			
Effective KVA supply required			111,77 kVA	**52,32 kVA**			
Total load in Amps (400V)			**161,33 Amps**	**75,52 Amps**			**124,40 Amps**

Note : All pumps and blowers for the entire works shall operate on a duty and stand-by basis only.

(This could change to 2 x duty pumps in the future)

The alternator shall be single bearing brushless type with 2/3 pitch winding / class H insulation; Voltage regulation plus 1.5%; low harmonic distortion with IP 21-degree protection. The alternator

shall be type DINGOL or Leroy Somer or other similar and equal approved. A base fuel tank sized to operate the full run load for a period of 12 hours continuous running shall be provided with the unit including fuel gauge, filler cap, dished bottom with drain and plug. The tank is to be hot dipped galvanised due to the gen-set being installed in a corrosive environment.

The gen-set shall be supplied complete with vandal proof locking mechanisms to prevent theft and vandalism.

A self-contained bund to contain any fuel spillages or leaks shall be provided with the tank and be included in the price. A drain valve shall be installed for the bund drainage. A hand pump with all fittings and hoses shall be supplied with the unit for filling of the diesel base tank.

All civil requirements such as plinth details, cable sleeve requirements etc are to be provided by the generator manufacturer.

Control panel:
The automatic mains failure plant mounted type 3CR12 control panel shall be finished in red baked epoxy. It shall be equipped with the following:

- One suitably rated incoming isolator.
- One suitably rated alternator circuit breaker with adjustable thermal and magnetic overloads.
- One set of suitably rated mechanically and electrically interlocked change over system 4 pole switching.
- One set of three current transformers.
- One 3 amp automatic battery charger with short circuit protection.
- One emergency stop button.
- All necessary control circuit breakers and relays all wired to terminals.
- One PLC “DEEP-CEA” type generator control unit with the following features shall be installed:
- Accurate metering and monitoring system with commands to start, change over, and stop the
- Facilities for signals to the remote PLC or telemetry system shall be provided for mains incoming breaker open/closed, feeder breaker open/closed, generator run/stop, low fuel and fire alarm.
- Two 24V DC fire alarm detectors shall be shall be installed in the canopy and wired to the control unit and to the remote PLC or telemetry unit.
- The unit shall be fitted with a low fuel level cut-out facility.

The following minimum viewable functions are to be included:

- Battery voltage
- Mains and alternator voltage
- Phase currents and frequency.
- Fuel level

Facilities shall be provided in the PLC to manually and auto-start the generator from the PLC and for remote starting from the future Monitoring/SCADA/DCS system.

Full wiring diagrams and details of the control panel shall be submitted to the Engineer and Client for comments and approval prior to manufacture of the unit. Details, general arrangements, specifications and manufacturer part numbers etc of all components and equipment shall be supplied with the wiring diagrams.

Standard fittings shall include exhaust with residential silencer and maintenance free lead calcium battery.

The generator canopy shall be fitted with air supply and exhaust louvres or grilles for the generator and radiator ventilation and cooling. The generator and radiator discharge air louvre and ducting shall be fitted between the gen-set and the entrance door which shall be louvred where the sets are installed in rooms. All louvres and ducting shall be stainless steel, louvres shall be fitted with stainless steel insect mesh or screens. The sizes and dimensions of the louvres and ducting shall be determined by the gen-set

manufacture in conjunction with the drawings submitted. The final dimensions shall be measured and determined on site prior to manufacture of the louvres and ducting.
The canopy shall be fitted with vandal proof locking mechanisms on the doors and other access points.
The container shall be painted dark grey, to be confirmed at order stage. Details of the paint specifications shall be provided later.

Prior to delivery or despatch, a FAT (factory acceptance test) shall be undertaken and the set shall be given a full load test and a Test Certificate produced and submitted. Prior and sufficient notice shall be given for all tests. A SAT (site acceptance test) and full testing and commissioning of the gen-set/s shall be undertaken on site and a Test Certificate issued. These tests and recordings shall be included with the Operator's and Maintenance manual. Five hard copies and five soft copies of the O & M manuals shall be supplied on successful commissioning of the generator set.

Statutory notices and warning signs shall be fitted to the unit to suit the standards and regulations pertaining to gen-sets.

The set shall be supplied with a full tank of diesel on delivery to site for testing and commissioning.

Full details and technical specifications of the complete generator set with motor, alternator, control panel etc set shall be provided with the tender or quotations for evaluation purposes. The returnable data sheet shall be submitted with the quotations or tender.

The gen-set supplier/manufacturer shall design and select the final generator set capacity and price accordingly before the tender closes. The consultant or engineer shall not take responsibility of the final gen-set capacity. The loads as per the load schedule shall be started and operated by the generator selected.

SDG.1.4 Installation

The gen-set is to be installed on a concrete plinth in the new generator position in the location shown on the drawings or as decided later on site. Access will be restricted, so the generator supplier is to take cognisance of this is his tender.

B. TENDER

The generator supplier shall submit tenders or quotations for each generator set as specified.
The tender or quotation shall be in the format of the bill of quantities and accompanied by a company letter
head and the quotation shall be broken down as follows or as itemised in the bill of quantities submitted with the tender :

- Genset with base, frame, engine, alternator, exhaust etc complete (corrosion proof canopy)
- Built in fuel tank
- Self contained bund (corrosion resistant)
- Generator canopy etc complete (corrosion resistant)
- Louvres, sound attenuation etc complete
- Control panel complete as specified
- Deep Sea controller
- PLC , I/Os etc
- Power cabling
- Instrumentation and control cabling
- Battery set
- Low fuel shut off
- Fire alarm detection system
- Delivery to site, offloading and rigging
- Full tank of fuel
- Testing and commissioning (including FAT & SAT)
- Statutory signages and notices

- Hand over & certificates
- Electrical COC
- O & M manuals
- Other

Note : The final tender bill of quantities shall be as per the schedule in the contract tender documents.

Name of Contractor : …….

Signature : …….. Date : ……..

CONTRACT No :

HARRY GWALA DISTRICT MUNICIPALITY

UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

UNDERBERG

DIESEL POWERED GENERATOR SET AND INSTALLATION

ANNEXURE A - DATA SHEET (TO BE COMPLETED AND SUBMITTED BY TENDERER – 1 FOR EACH SET or SITE)

SITE …….

GEN SET / INSTALLATION No:……

	DESCRIPTION	UNIT	SPECIFIED	OFFERED	OTHER
1	**GENSET RATINGS**				
1,1	Supplier		Sinabo (Ultimate Group) or similar approved		
1,2	Generator continuous power rating	kVA	Refer load schedule		
1,3	Typical generator power output (COP)	kVA			
1,4	Typical generator power output (PRP)	kVA			
1,5	Typical generator power output (LTP)	kVA			
1,6	Alternator efficiency	%			
1,7	Load acceptance recovering time				
1,8	At 80% continuously power (COP)	sec			
1,9	At 100% continuously power (COP)	sec			
2	**ENGINE (MOTOR)**				
2,1	Country of origin				
2,2	Country of manufacturing				
2,3	Make		As specified		
2,4	Is serial number traceable to manufacturer	Yes / No	Yes		
2,5	Model - Turbo charged	Yes / No	Yes		
2,6	Model - Natural aspirated	Yes / No			
2,7	Type				
2,8	Cylinders	Qty			
2,9	Water cooled	Yes / No			
2.10	Air cooled	Yes / No			
2,11	Kilowatt - continuously	kW			
2,12	Kilowatt - prime rated power	kW			
2,13	Kilowatt - limit	kW			
2,14	Speed	RPM			
2,15	Governor - type				
2,16	Governor - make				
2,17	Over rev alarm and output	Yes / No			
3	**FUEL SYSTEM TYPE - CONSUMPTION AT COP**				
3,1	25% Load	L/hr :gm/kWh			
3,2	50% Load	L/hr :gm/kWh			

3,3	75% Load	L/hr :gm/kWh			
3,4	100% Load	L/hr :gm/kWh			
3,5	Fuel line/pipe - type		Black Steel HDG		
3,6	Fuel tank material				
3,7	Fuel tank filter type				
3,8	Base mounted fuel tank (at least 12 hours)	Yes/No	Yes		
3,9	Fuel tank size				
3,10	Litres	L			
3,11	Height	mm			
3,12	Length	mm			
3,13	Width	mm			
3,14	Hand fuel pump	Yes/No	Yes		
3,15	Self contained bund built with set(to contain leaks)		Yes		
4	**COOLING SYSTEM TYPE**				
4,1	Cooling volume - engine	Litres			
4,2	Cooling volume - radiator	Litres			
4,3	Maximum coolant operating temperature	°C			
4,4	High temperature alarm at 95% of coolant operating temperate to manufacturer's spec	°C			
4,5	High temperature alarm and cut out switch	Yes/No	Yes		
4,6	Airflow volume through cooling system	m³			
4,7	Airflow volume through cooling system as per manufacture specification	Yes/No	Yes		
5	**EXHAUST TYPE**				
5,1	Type of exhaust system		Industrial		
5,2	Exhaust gas maximum flow at full load (COP)				
5,3	Exhaust emission tier level		Tier 2		
5,4	Material for lagging		Stainless Steel 316		
	DESCRIPTION	**UNIT**	**SPECIFIED**	**OFFERED**	**OTHER**
6	**ENGINE (ELECTRICS)**				
6,1	Battery type	12V/24V			
6,2	Batteries	Qty			
6,3	Minimum capacity	Ah/battery			
6,4	Starter	kW			
6,5	Alternator	A/V			
6,6	Coolant pre-heating unit-type				
6,7	230 Volt battery charge (with auto trickle charge) - make				
6,8	Battery charger volt meter	Yes/No			
6,9	Manual stop and start ignition	Yes/No	Yes		
6.10	Engine trip reset	Yes/No	Yes		
7	**COLD START CAPACITY - TYPE**				
7,1	Cold start limit temperature with starting aid	°C			
7,2	Cold start limit temperature without starting aid	°C			
8	**SKID**				
8,1	Type of vibration pads / mounting for skid				
8,2	Type of vibration pads / mounting for engine				
8,3	Type of vibration pads / mounting for generator / alternator				
8,4	Drawings of frame structure included	Yes/No	Yes		
8,5	Size of skid				

8.5.1	Height	mm			
8.5.2	Length	mm			
8.5.3	Width	mm			
8,6	Bund for spillage required (110% of capacity) with drain valve		Yes		
9	**GENERATOR / ALTERNATOR**				
9,1	Country of origin				
9,2	Country of manufacturing				
9,3	Make		Dingol, Leroy Somer or similar approved		
9,4	Model				
9,5	Is serial number traceable to manufacturer	Yes/No	Yes		
9,6	Prime power	kVA			
9,7	Standby power	kVA			
9,8	Phase	1 to 3	3		
9,9	Supply Voltage	V	400		
9.10	Supply Frequency	Hz	50		
9,11	Number of pole alternator circuit breakers	3 or 4	4		
9,12	Change over contactors or circuit breaker				
9,13	3 Pole main isolator	A			
9,14	3 Pole air circuit breakers with overload and short circuit protection	A			
10	**CONTROL PANEL/INDICATION/INSTRUMENTS**				
10,1	Automatic / Manual				
10,2	Remote / Local				
10,3	Type of controller				
10,4	Make of controller		Deep SEA or similar		
10,5	Model of controller				
10,6	Remote monitoring	Yes/No	Yes, interface with MCC PLC		
10,7	Signals wired to PLC (Run, stop, low fuel shut-off, fuel level(4-20mA) , fault , fire detection/alarm		Yes		
10,8	GSM module for SMS alarm notification	Yes/No	Yes		
10,9	AMF incorporated	Yes/No	Yes		
10,10	Synchronized with mains	Yes/No	Yes		
10,11	Manufacture, type and model of switchgear				
10,12	Wiring diagrams and GA to be submitted		Yes		
11	**CONTROL PANEL CONSTRUCTION**				
11,1	Type of material /steel		3CR12		
11,2	Epoxy Powder Coated	Yes/No	Yes		
11,3	Size of electric panel				
11.3.1	Height	mm			
11.3.2	Length	mm			
11.3.3	Width	mm			
11.34	Vandal proof locking mechanism	Yes	Yes		

	DESCRIPTION	UNIT	SPECIFIED	OFFERED	OTHER
12	**OPERATING ENVIRONMENT**				
12,1	Inland/Coastal		Coastal		
12,2	Inside /Outside		Outside		
12,3	Ingress Protection	IP			
12,4	Site Conditions - Altitude	m	Underberg - Alt : 1553 msl : 15-45deg C ,40-90%RH		

12,5	Site Conditions - Min/Max Ambient Temp.	°C / °C			
12,6	Site Conditions - Min/Max Relative Humidity	%/%			
13	**DUMMY LOADS**				
13,1	Dummy loads required	Yes/No	No		
13,2	Size of Dummy Load	% of Generator Capacity	%		%
13,3	Positing in cowling	Yes/No	Yes		
14	**LOUVRES**				
14,1	Louvres size according to Manufacturers Requirements	H X L X W			
14,2	Type		Acoustic		
14,3	Material of Construction		304L		
14,4	DB level required after acoustics louvres and sound proofing	DB	65		
15	**GENERAL**				
15,1	Warranty / guarantee - Engine	months	12		
15,2	Warranty / guarantee - Generator / Alternator	months	12		
15,3	Warranty / guarantee - Canopy	months	12		
15,4	Warranty / guarantee - Control panel	months	12		
15,5	Delivery time (after official order number received)	weeks			
15,6	Weight - Complete Generator Set	kg			
15,7	Largest Motor Load that can be started at once	kW			
15,8	Additional datasheet from manufacturer included with tender	Yes/No	Yes		
15,9	Servicing/maintenance	Yes/No			
15,10	COC required	Yes/No	Yes		
16	**EXTRAS**				
16,1	Fuel shut off valve	Yes/No	Yes		
16,2	Fireman switch	Yes/No	Yes		
16,3	Hand fuel pump	Yes/No	Yes		
16,4	Fuel level indicator with output to controller	Yes/No	Yes		
16,5	Fire detector and alarm system with signal to PLC required	Yes/No	Yes		
17	**CANOPY OR CONTAINER**				
17,1	Canopy or container required		Yes (canopy)		
17.1.1	Height	mm			
17.1.2	Length	mm			
17.1.3	Width	mm			
17,2	Type of canopy material / steel		3CR12		
17,3	Type of paint : epoxy powder coating	Yes/No			
17,4	No. of access doors and sizes				
17,5	No, size and type of air louvres				
17,6	No, size and type of filters				
17,7	Drawing required of canopy/container with louvres	Yes	Yes		
17,8	Drawing required of exhaust ducting	Yes	Yes		
17,9	Vandal proof locking mechanism	Yes	Yes		
17,10	Other details				
18	**SUPPLEMENTARY DETAILS**				

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

Date : _____

Name:_____ Signature: _____

Name of Contractor / Manufacturer : _____

Company stamp :

HARRY GWALA DISTRICT MUNICIPALITY

UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

UNDERBERG

GS-SDG : STAND-BY DIESEL GENERATOR – STANDARD GENERAL SPECIFICATIONS

STANDARD GENERAL SPECIFICATIONS

SECTION 1 - GENERAL

PS 1.1 General

In addition to the project specifications, the stand-by generators/s shall comply to the following standard specifications :

Specification and Documentation

The specification is intended to cover the complete supply and 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 recognized 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 that are required to complete the installation.

PS 1.2 Scope of Work

Supply, delivery and installation of the complete emergency stand-by diesel generator set as specified in this document or particular technical specifications. The civil works will be provided by other trades and the contractor shall ensure that the space allowed is sufficient for the installation of the generator set. The generators are to start up on receiving an external signal. On completion of the startup and self-check, they are to synchronize on to a common bus. Once one or both generators are connected then the bus circuit breaker must close and supply power to the remote changeover system, supplied by others. In addition, the control panel is to be equipped with a comms and reporting module with a GSM package for alarms and notification reporting.

The generator build shall be a silent type diesel engine close coupled to a brushless alternator, all on a fabricated steel base via anti-vibration mounts and mounted in a standard canopy or shipping type container as specified in the particular technical specifications. The sizes of the canopy or container shall be determined by the manufacturer. Sound attenuation shall be provided for the set and the shipping container and the noise levels kept to minimum decibel values.

Standard fittings shall include exhaust with residential type silencer. The shipping container shall be fitted with air supply and exhaust louvres or grilles for the generator and radiator ventilation and cooling. The container shall be fitted with vandal proof locking mechanisms on the doors and other access points. The container shall be painted white to match the existing. Details of the paint specifications shall be provided later.

PS 1.4 Safety

Allowance must be made in the price for a safety file and for any cost as required for adherence to Safety,
Environmental and on-site administration thereof.

PS 1.5 Co-ordination

The contractor shall co-ordinate his program with the Civil, Structural, Electrical and Building Contractor as required for installation. Rates shall include for and rigging etc. Any building or civil works to be by others.

PS 1.6 Test Certificates and Inspections

The following tests are to be carried out:

(a) At the supplier's premises, before the generating set will be delivered to site the Engineer/Consultant shall be present during the test to satisfy them that the generating set complies with the specification and delivers the specified output. The test must be carried out in accordance with BSS 5514, Part 2 and 3. The Engineer/Consultant 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 shall be carried out on the installation for a period of sufficient duration to determine the satisfactory working thereof. During this period the installation shall be inspected, and the contractor shall make good, to the satisfaction of the Engineer/Consultant, 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/Consultant.

PS 1.7 Guarantee and Maintenance

The Contractor shall provide a warrantee for the complete plant for a period of twelve months after final completion. The plant shall be serviced and maintained free of charge during the 12 months defects liability period.

If during this period the plant is not in working order, or not working satisfactorily owing to faulty material, design or workmanship, immediate steps shall be taken to rectify the defects and/or replace the affected parts on site at his own expense.

Should the Contractor fail to hand over the plant in good working order on the expiry of the specified twelfth month warrantee period, 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 checklist shall be provided with the following items:

(a) Report to the Engineer/Consultant, keeping the maintenance records, and enter into a logbook the date of the visit, the tests carried out, 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 the filter and 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 shall 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 switchgear, the protective devices with fault indicators, the changeover equipment and the battery charger. Make any necessary adjustments necessary.

(j) Report to the Engineer/Consultant any parts that become unserviceable through fair wear and tear, or damaged by causes beyond the control of the Contractor.

(k) Advise the Engineer/Consultant when it has become necessary to de-carbonize 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.

PS 1.8 Material and Workmanship

(a) The work throughout shall be executed to the highest standards and to the entire satisfaction of the Engineer/Consultant who shall interpret the meaning of the Contract Document and shall have the authority to reject any work and material, 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 a qualified tradesman.

(c) The Contractor shall warrant that the materials and workmanship shall be of the highest quality and standard, 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 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 installation relating to his own work as may be necessary for the proper installation work and shall co-operate with and co- ordinate the work with others as may be applicable.

(d) 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 Contract's scope of works.

(e) All control equipment and serviceable items shall be installed and positioned such that they will be accessible and maintainable.

(f) 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 User Client.

PS 1.9 Brochures

Detailed brochures of all equipment offered shall be presented together with the tender documents.

PS 1.10 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 Tendered must, as soon as possible after receipt of the order, submit detailed plant and mechanical drawings and wiring diagrams of the plant and the switchgear and control gear. One diagram shall be contained in a metal pouch on the side of the switchboard.

(d) All civil and building requirements for the generators , container, canopy and step-up or step-down transformer

SECTION 2 – EQUIPMENT REQUIREMENTS

PS 2.1 Engine

Deutz, Perkins, Cummins, UK or USA, VOLVO or SCANIA diesel engines shall be provided as specified under the particular technical specifications. Preference will be given to engines that match the existing on
site.

PS 2.1 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 suitably 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.

PS 2.2 Sound attenuation

Sound attenuation is to be supplied to attain a specification of NC 80dB at 10 meters. The colour of louvres shall to be natural finish to match existing finishes or as specified.

PS 2.3 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.

PS 2.4 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/Consultant and must be motivated in detail. Such de-rating must be guaranteed in writing and proved by the successful tenderer at the site test.

PS 2.5 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.

PS 2.6 Starter Battery

The generator set must be supplied with a fully charged maintenance free lead-acid type battery, complete with the 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 150 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 shall be of the heavy duty “low maintenance” type, house in a suitable battery box.

PS 2.7 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 or control panel. Water-cooled engines shall in addition be fitted with 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 and cooling ducts for the cooling of the engine are to be allowed for. The air shall be supplied from the cooling fan cowling/radiator face to air outlet louvers of the weatherproof enclosure.

PS 2.8 Lubrication

Lubrication of the main engine 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 or control panel.

PS 2.9 Fuel Pump

The fuel injection equipment and fuel pump/s shall be suitable for operation with the commercial brands of diesel fuel normally available in South Africa.

PS 2.10 Fuel Tank

The base tank shall have sufficient capacity for standby sets to run the engine on full load for a period of 12 hours. Base tank shall be double skinned/self-bunded.

A base fuel tank sized to operate the full run load for a period of 12 hours continuous running shall be provided with the unit including fuel gauge, filler cap, dished bottom with drain and plug.

A self contained bund to contain any fuel spillages or leaks shall be provided with the tank and be included in the price. A hand pump with all fittings and hoses shall be supplied with the unit for filling of the diesel base tank.

PS 2.11 Governor

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 ± 5% at all loads, zero and rated load.

PS 2.12 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.

PS 2.13 Exhaust Silencer

It is essential to keep the noise level as low as possible. An effective exhaust silencing system of the 3CR12 residential type must be provided. The exhaust pipe shall be installed in such a way that the expulsed exhaust fumes will be as directed away. The exhaust pipe must be flexibly connected to the engine to take up vibrations transmitted from the engine, which may cause breakage.

PS 2.14 Accessories & Manuals

The engine must be supplied complete with all accessories, air and oil filters, 3 sets of instruction operating and maintenance manuals, spare parts lists, the first fill of all lubricating oils, fuel, etc

Wiring and plant diagrams shall be included in the manuals.

PS 2.15 Alternator

Alternator make shall be : Dingol, Stamford, Morelli, Motorelli, Engga, Leroy Somer, Marathon or Maccallte. Preference will be given to alternators such as Dingol, Morelli , Leroy Somer etc and that match existing systems used by the Client.

NOTE:

The generator is to comply with Tier 2 omissions standards as defined by the United States Environmental Protection Agency (EPA) or the equivalent European Stage IIA standard. The standby generator shall comply with all the requirements of BS 5514, BS 4999 and BS5000 part three as applicable

PS 2.16 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.
The alternator shall be single bearing brushless type with 2/3 pitch winding / class H insulation; Voltage regulation plus 1.5%; low harmonic distortion with IP 21 degree protection.

PS 2.17 Regulation

The alternator must preferably be self-regulated without the utilisation of solid state elements. The inherent voltage regulation shall 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 5% between no-load and full load.

PS 2.18 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 milliseconds following the application of full load and the transient voltage dip shall not exceed 18%.

PS 2.19 Synchronizing

The alternator must be fully setup and supplied with all equipment requiring for the synchronizing of the new and existing units.

PS 2.20 Coupling

The engine and alternator must be directly coupled by means of a high quality flexible coupling, equal and similar to the “HOLSET” type.

PS 2.21 Switchboard

PS 2.21.1 General

A switchboard must be supplied and installed to incorporate the equipment for the control and protection of the generating set and battery charging system.
The switchboard must conform to the specification as set out in the following paragraphs.

PS 2.21.2 Construction

The switchboard shall be a totally enclosed, floor or wall plant mounted unit, fabricated from 3CR12 steel panels, carried on and-substantial angle iron hot dipped galvanised framework.

The board shall be flush fronted and all equipment to be mounted behind the front plate, on suitable supports.
All equipment, connections and terminals shall be easily accessible from the front. The front panels may be either hinged or removable and fixed with studs and chromium-plated cap nuts. Self tapping screws shall not be used in the construction of the board.

All pushbuttons, pilot lights, control switches, instrument and control fuses, shall be mounted on hinged panels with the control wires in flexible looms.

The steelwork of the boards must be thoroughly de-rusted, primed with zinc chromate and finished with two coats of signal red quality enamel, or a baked powder epoxy coating.

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.
For the control wiring, each wire shall be fitted with a cable or wire marker of approved type, and

numbering of these markers must be shown on the wiring diagram on the switchboard or control panel. Control wiring shall be run in PVC trunking. The trunking shall be properly fixed to the switchboard steelwork. Adhesives shall not be acceptable for the fixing of trunking or looms.

All equipment on the switchboard, such as contactors, isolators, bus bars, etc., shall have ample current carrying capacity to handle at least 110% of the alternator full load current

PS 2.21.3 Protection and Alarm Devices

All switchboards and control panels shall be equipped with protection and alarm devices as described below.
A circuit breaker and an adjustable current limiting protection relay shall 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 must be provided for overload, high engine temperature, low lubricating oil pressure, over speed, start-failure, and low water level.
The indicators and re-set push buttons must be as described below. GSM and alarm reporting shall be included.

“OVERLOAD”
“TEMPERATURE HIGH”
“OIL PRESSURE LOW”
“OVER-SPEED”
“START FAILURE”
“LOW WATER LEVEL”
“LOW FUEL LEVEL”
“NO FUEL LEVEL”

PS 2.21.4 Battery charging Equipment

Each switchboard or control panel 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

also be provided for charging the battery while the set is operational. Failure of this alternator must also activate the battery charger failure circuit.

PS 2.21.5 Switchboard Instruments

The following controller is preferred:

Deepsea 8610, no other controller will be accepted. All protective circuit breakers/ change over switches are to be ABB or similar and equal approved. All alternatives shall be approved by the Engineer prior to the tenders closing.

PS 2.21.6 Earthing

An earth bar must be fitted in the switchboard or control panel, to which all non-current carrying metal parts shall
be bonded.
The neutral point of the alternator must be solidly connected to this bar by means of a removable link labelled “EARTH”. 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.

PS 2.21.7 Installation

Except for the outgoing feeder cables, the tenderer must include for the complete installation and wiring of the plant in running order. The connecting of the cable and control cabling to the generator and the control terminals in the LV board remains the responsibility of the tenderer.

PS 2.22 Warning Notices

Notices, in both official languages, must be installed on the front face of the standby plant. The contents of these notices are summarised below.

(a) Unauthorised work on equipment prohibited.
(b) Unauthorised handing of equipment prohibited.
(c) Procedure in case of electric shock, electrical danger signage, warning machine starts automatically . no un-authorised entry signage shall be suppled and installed

The successful tenderer must consult the latest Occupational Health and regarding these waning and statutory notices. Lettering must be black on a yellow background.

Notices (a) must be installed outside next to the entrance of the standby plant front face adjacent to the service hatch, this can be discussed in detail during the manufacture and installation stage.

The motive shall be made of a non-corrodible and non-deteriorating material, preferable plastic, 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.

PS 2.23 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. 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.

The generator enclosures are to be container type steel enclosures with sound attenuation on the air intake and outlets. Access doors are to be on both sides of the unit allowing access to the control panel.

PS 2.24 Operation

The set shall be fully automatic i.e. it shall start on a signal supplied remotely. In addition, it shall be possible to manually start and stop the set by means of pushbuttons on the switchboard or control panel.

The automatic control shall make provision for three consecutive starting attempts. Thereafter the set must be switched off, and the start failure indication on the switchboard must give a visible and audible indication of the fault.

The units are to synchronize with each other via the common bus. Once both units are connected then the common bus needs to be connected to the changeover system. To prevent the alternators being electrically connected to each other in an unsynchronized state, a safe and fail proof system shall be designed and integrated into the system.

The DSE Webnet system is to be fully installed and maintained for the duration of the warranty period. The operational communication system is to be handed over with training to the Plant Operations staff.

PS 2.25 Switchboard/Control Panel Unit

PS 2.25.1 General

All switch- and control gear shall be rated for a fault current level of 15kA.

The switchboard shall be floor standing or plant wall mounted type and shall be supplied in accordance with clause of Section 2 of this specification, and shall incorporate the following additional switch gear, accessible through the front panel:

PS 2.25.2 AMF controller

A DSE8610 Remote start synchronising control system shall be provided.
This is also to provide for no-break load testing of the Generator by way of selector switch on the panel. The AMF shall accept loading within a maximum of 30 second as from a mains failure condition.

PS 2.25.3 Control panel:

The automatic mains failure plant mounted type 3CR12 panel shall be finished in red baked epoxy. It shall be equipped with the following as a minimum :

- One suitably rated incoming isolator.
- One suitably rated alternator circuit breaker with adjustable thermal and magnetic overloads.
- One set of suitably rated mechanically and electrically interlocked change over system 4 pole switching.
- One set of three current transformers.
- One 6 amp automatic battery charger with short circuit protection.
- One emergency stop button.
- All necessary control circuit breakers and relays all wired to terminals.
- One PLC based “DEEP-SEA” type generator control unit with the following features:

- Accurate metering and monitoring system with commands to start, change over, and stop the set.
- Facilities for signals to the remote PLC or telemetry system shall be provided for mains incoming breaker open/closed, feeder breaker open/closed, generator run/stop, low fuel and fire alarm.
- The unit shall be fitted with a low fuel level cut-out facility.
- Two 24V DC fire alarm detectors shall be installed in the container and wired to the control unit and to the remote PLC or telemetry unit.
- The following minimum viewable functions are to be included: Battery voltage, mains and alternator voltage, phase currents and frequency.

Full wiring diagrams and details of the control panel shall be submitted for comments and approval prior to manufacture of the unit. Details, general arrangements, specifications and manufacturer part numbers etc of all components and equipment shall be supplied with the wiring diagrams.

PS 2.26 Regulations and Other Requirements

The installation shall be erected and tested in accordance with the following acts and regulations:

a) The latest issue of SABS 0142: “Code of practice for the wiring of premises.”

b) The Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended.

c) 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.

d) The Fire Brigade Services Act 1993 Act 99 of 1987 as amended.

e) The National Building Regulations and Buildings Standards Act 1977 (Act 103 of 1977) as amended

f) The Post Office Act 1958 (Act 44 of 1958) as amended.

g) The Electricity Act 1984 (Act 41 of 1984) as amended.

PS.2.27 Other Requirements

Prior to delivery, a FAT (factory acceptance test) shall be undertaken and the set shall be given a full load test and a Test Certificate issued. A SAT (site acceptance test) and full testing and commissioning shall be undertaken on site and a Test Certificate issued. These tests and recordings shall be included with the Operator’s and Maintenance manual. Four hard copies and three soft copies of the O & M manuals shall be supplied on successful commissioning of the generator set. An electrical COC for the electrical installation of the generator set shall be provided by the contractor.

Statutory notices and warning signs shall be fitted to the unit.

A 5kg CO2 fire extinguisher with all necessary signage shall be supplied and installed for each generator set.

The set shall be supplied with a full tank of diesel on delivery to site.

The generator set shall be guaranteed, maintained and serviced for a period of 12 months after the issue of the practical completion certificate. Full details of the servicing and maintenance plan shall be submitted with the tender.

Full details and technical specifications of the complete generator set with motor, alternator, control panel etc set shall be provided with the tender or quote for evaluation purposes. The returnable data sheet shall be submitted with the quotations.

PROJECT SPECIFIC OCCUPATIONAL HEALTH AND SAFETY SPECIFICATION

FOR

UNDERBERG HIMEVILLE SEWER UPGRADE: REFURBISHMENT (WARD 3 & 2)

CONTRACT No. HGDM902/HGDM/2026

MANAGED ON BEHALF OF

HARRY GWALA DISTRICT MUNICIPALITY
(THE "CLIENT")

KEY ROLE PLAYERS

CLIENT

Principal Agent: _____

Civil Engineer _____

Quantity Surveyor _____

Land Surveyor _____

Mechanical Engineer _____

Environmental Control Officer _____

Health and Safety Agent _____

PRINCIPAL CONTRACTOR

Contracts Manager _____

Site Agent _____

H&S Officer _____

Other: _____

ANNEXURES

ANNEXURE A: **EXAMPLE HEALTH AND SAFETY AUDIT DOCUMENT**

ANNEXURE B: **CLOSE OUT REQUIREMENTS**

ANNEXURE C: **NON-CONFORMANCES**

ANNEXURE D: **CONTRACTORS MONTHLY HEALTH AND SAFETY REPORT**

ANNEXURE E: **RISK ASSESSMENT FORMAT**

ANNEXURE F: **BILL OF QUANTITIES FOR OCCUPATIONAL HEALTH AND SAFETY**

ANNEXURE G: **HEALTH AND SAFETY (H&S) PRE-TENDER REPORT**

ANNEXURE H: **TENDER STAGE OHS PLAN EVALUATION**

ANNEXURE I: **MANDATORY AGREEMENT**

LIST OF ABBREVIATIONS

AIA	Approved Inspection Authority
BoQ	Bill of Quantities
CC	Compensation Commissioner
CR	Construction Regulations
DMR	Driven Machinery Regulations
DoL	Department of Labour
FEMA	Federated Employers Mutual Association
GAR	General Administration Regulations
GSR	General Safety Regulations
HCSR	Hazardous Chemical Substances Regulations
HIRA	Hazard Identification Risk Assessment
H&S	Health and Safety
ER	Engineer's Representative
LI	Labour Intensive
OH	Occupational Health
OHSA	Occupational Health and Safety Act No. 85 of 1993 (as amended)
OHSS	Occupational Health and Safety Specification
PSHSS	Project Specific Health and Safety Specification
PC	Principal Contractor
PPE	Personal Protective Equipment
SANS	South African National Standards (Authority)
MSDS	Material Safety Data Sheet
SMME	Small, Micro, Medium Enterprise
SWP	Safe Work Procedure

DEFINITIONS

The definitions used will be those set out in the Construction Regulations, Gazette No 37305 of 7 February 2014 which are hereunder further emphasised with the following additions:

Client: Harry Gwala District Municipality

Construction Site: Means a workplace where construction work is being performed

Construction Supervisor: Means a competent person responsible for supervising construction activities on a construction site

Designer: Means a competent person appointed by the Client as Agent to design, supervise and monitor construction on their behalf.

Fall Risk: Means any potential exposure to falling either from, off or into

Hazard: Source of or exposure to danger

Hazard Identification and Risk Assessment (HIRA) and Risk Control:

Means a documented plan, which identifies hazards, assesses the risks and details the control measures and safe working procedures which are to be used to mitigate and control the occurrence of hazards and risks during construction or operation phases.

Health and Safety Agent:

Means any competent person who acts as a representative for the Client in managing the projects health and safety and who is registered with the South African Council for the Project and Construction Management Profession (SACPCMP).

Health and Safety Plan:

Means a site, activity or project specific documented plan in accordance with the Clients Health and Safety Specification.

Induction Training:

Means once off introductory training on general health and safety issues given to all employees and visitors to the site before commencement of work on site.

Risk: Means the probability or likelihood that a hazard can result in injury or damage.

Regulation/s:

Shall mean the relevant regulation/s promulgated in terms of the Occupational Health and Safety Act, No. 85 of 1993.

Temporary Works:

Means any falsework, formwork, support work, scaffold, shoring or other temporary structure designed to provide support or means of access during construction work

The Act: Means, unless the context indicates otherwise, the Occupational Health and Safety Act, No. 85 of 1993 and Regulations promulgated thereunder, as amended.

KEY REFERENCES

The following key references apply to the specifications:

- Occupational Health and Safety Act No. 85 of 1993 and Regulations (as amended)
- Compensation for Injury and Occupational Diseases Act No. 100 of 1993 (as amended)
- SANS Code 1921-6
- SANS Code 1200

INTRODUCTION

Harry Gwala District Municipality is responsible for the provision of adequate and reliable water and sanitation services within the district and takes cognizance that its current scope of works poses inherent risks to the health and safety of its agents and members of the public.

Each year fatalities, serious injuries and poor attitudes of Contractors mar the reputation of the Construction Industry. Harry Gwala District Municipality has a responsibility to limit its risk by ensuring a zero tolerance and better practice approach to Contractors and those affiliated to a particular project. Thus, a high premium is placed on the health and safety (H&S) of Harry Gwala District Municipality stakeholders, which include its employees, professional service providers, public and its physical assets. The responsibilities that the Harry Gwala District Municipality and relevant stakeholders have toward its employees are captured in, but not limited to this document. The responsibilities stem from both moral, civil and a variety of legal obligations. The Principal Contractor is to take due cognisance of the above statement.

Harry Gwala District Municipality, as the Client and where there is an appointed H&S Agent on its behalf, shall provide a project specific Health & Safety Specification (PSHSS) for the project and provide the Principal Contractor/s making a bid or appointed to perform construction work for the project, or parts thereof.

4.1 Purpose of the Project Specific Health and Safety Specification (PSHSS)

The PSHSS is a performance specification to ensure that the Client and any bodies that enter into formal agreements with the Client Viz. Agents, Professional Service Consultants (Engineers, Quantity Surveyors and Land Surveyors), Principal Contractors and Contractors achieve an acceptable level of OHS performance. No advice, approval of any document required by the PSHSS, such as hazard identification and risk assessments, or any other form of communication from the Client shall be construed as acceptance by the Client of any obligation that absolves the Principal Contractor from achieving the required level of performance and compliance with legal requirements. Furthermore, there is no acceptance of liability by the Client, which may result from the Principal Contractor failing to comply with the PSHSS, i.e., the Principal Contractor remains responsible for achieving the required performance levels.

A Mandatary Agreement in terms of Section 37.2 of the OHSA will be signed between parties prior to any works commencing.

The PSHSS highlights the aspects to be implemented over and above the minimum requirements of current legislation. Requirements may be changed should new risks or issues are identified that could not have been foreseen during the design phase of the project, or during the construction phase. Any new legislation or standards (legislated or determined by Harry Gwala District Municipality) that are promulgated or accepted during the contract will automatically be applied.

Environmental management shall receive due attention as per the requirements of the Environmental Control Officer (ECO) but will be managed by the ECO directly.

4.2 Implementation of the Project Specific Occupational Health and Safety Specifications (PSHSS)

The project specific H&S specification (PSHSS) forms an integral part of the Contract, and PCs are required to make it an integral part of their Contracts with Contractors and Suppliers. A PSHSS will be available for each level of Contract and Contractor and must be complied with.

This specification must be read in conjunction with the OHSA, Regulations (as amended) and any other standards relating to work being done and ensure compliance thereto. The information relative to the scope of the project, the works etc. are detailed in the tender, are to be considered when developing the H&S plan and associated documentation.

The OHSA S.37.2 Mandatary Agreement must be fully completed by the PC, supplied by the Client. These documents shall be deemed to form part of the returnable Contract Documents.

No work may commence without written approval of the H&S plan by the H&S Agent, or the responsible person in the Harry Gwala District Municipality.

Should there be design changes, or change in the scope of works, an amended PSHSS may be issued. Where amended PSHSSs are issued, the PC will be required to ensure a resubmission of an amended H&S plan for approval. Further to this, the PC must ensure that similar information must be provided as it applies to the works to all their Contractors, within 5 working days following notification thereof. The H&S Agent will visit the project as deemed necessary by the Designer and the H&S Agent to ensure compliance and limit risk. All activities on the site and all appropriate documentation will be monitored and reported on to the Client and the Designer.

Non-conformances will be issued, and penalties or work stoppage will be issued where appropriate. Communication between the H&S Agent and the PC will be through the Designer (or Client's responsible person) as determined at the commencement of the project.

4.3 Requirements at Tender Stage

Tenderers are required to submit a pre-tender H&S plan with their Tender submission.

The documentation submitted will be used to assess the competence of the tenderer, as required in the CRs, therefore the information submitted needs to be complete and as close as possible to the final product.

Adequate pricing for H&S is required, and the appropriate section in the BoQ is to be completed. Failure to do so could result in the Tender being regarded as non-responsive.

The PC shall ensure adequate information is submitted as supporting documentation with his completed Tender. Such information will be assessed against the criteria listed and a score provided to the Bid Award Committee (BAC) for consideration. Failure to provide such information could render the tender application non-responsive.

A project specific H&S Plan in response to this PSHSS will be subject to approval by the H&S Agent. This must include all supporting documentation as required to verify the H&S system:

- A declaration to the effect that he has the competence and necessary resources to carry out the work safely in compliance with the Occupational Health and Safety Act and its Regulations;

- A valid Letter of Good Standing;
- Detailed technical method statements for approval by the Designer and appropriate risk assessments and safe work procedures for approval by the H&S Agent or Client:
    - Site establishment including:
        - Clearing and grubbing;
        - Exposure of services, power, telecommunication etc.;
        - Arrangements for hoarding, traffic accommodation;
    - Excavating
    - An emergency plan indicating how and where emergencies will be handled
    - Working at heights
    - Appointments of the following: Construction Supervisor; Construction Health and Safety Officer; Risk Assessor: Fall Protection Plan Developer; First Aider.
    - An organogram of the site relationships showing at least the above appointments

Further method statements are to be submitted prior to, and during the project where changes or new work is required, and the approval of the Designer/Client is required before work on that aspect or activity can commence The H&S Officer is to be included in production planning sessions/meetings to ensure that the appropriate risk assessments, safe work procedures and communication required are available and completed timeously. Penalties will be applied should this not be adhered to and deemed a serious offence.

GENERAL REQUIREMENTS

5.1 Summary of Risks identified during Design

The intention of the summary of findings from the design risk assessment is to highlight the residual risks identified during the design phase. The summary of risks provided is to point the contractor towards some risks he may not be aware of during tendering stage and while developing his formal risk assessments for the project.

The design risks and the management thereof should be included in the Principal Contractors (PC) risk assessments. Where there are other Contractors appointed to do work, the PC is to ensure that Contractors include such information in their risk assessments.

The Contractor is herein advised that no other residual risks remain which the designers judged as significant and unusual other than those risks that a competent Contractor can reasonably be expected to know or deduce from the documents prepared for this project and supplied to them.

5.2 Specified Hazardous Chemical Substances

The following lists of products or substances are those which have been identified as likely to be used on the project. This list is not inclusive and other products may be considered. Where the PC is likely to supply the product as the product has not been specified, material safety data sheets (MSDSs) need to be considered prior to all selections.

PRODUCTS or SUBSTANCES	POTENTIAL HEALTH OR OTHER RISKS
Cement	• Hand mixing may occur, 50kg bags are an ergonomic risk from handling. • Pumping of concrete may produce extensive vibration, extended hours of work, and potential eye, skin and respiratory irritant from dust exposure, chromates.
Cement/Silica dust	Caused by cutting, grinding, sanding of any concrete/granite/tiled surface/masonry resulting in occupational respiratory health illness or disease
Petrol/diesel/lubricants	Potentially a fuel bowzer on site. Fire, spillage, fumes
Adhesives	Used as a bonding agent and may result in contact Dermatitis and occupational respiratory illness or disease from prolonged exposure
Plaster/mortar/screeds	Contact with products may result in Dermatitis and occupational respiratory illness or disease from prolonged exposure
Sealants/joint fillers	Contact with products may result in Dermatitis and occupational respiratory illness or disease from prolonged exposure
Welding fumes	Inhalation of fumes may result in occupational respiratory illness or disease from prolonged exposure
Lime	The product is classified an irritant, irritating the respiratory system, skin, and risk of serious damage to eyes. In contrast to the powder itself, the product, when diluted with water, can produce severe skin damage in humans, (*alkaline burns*), especially if prolonged skin contact takes place.
Paints	Contact with different paints may result in Dermatitis and occupational respiratory illness or disease from prolonged exposure

OCCUPATIONAL HEALTH & SAFETY MANAGEMENT

6.1 Structure and Organization of H&S Responsibilities

6.1.1 Notification of Commencement of Construction Work

The Client shall notify the Provincial Director of the Department of Labour (DoL) in writing, in the form of the Annexure 1 in the CRs for all projects requiring a work permit in terms of CR 3.

The PC who intends to carry out any construction work other than work noted in CR 3 shall notify the Provincial Director in writing in the form of the Annexure 2. This shall occur after the award of the contract, but before commencement of construction work. Proof of submission and/or receipt must be provided and kept in the H&S file. Work will not commence without the Notification being correctly completed and signed by the Client and proof of receipt by the Department of labour received. The Notification shall only be signed by the Client following the approval in writing by the H&S Agent, or the Client.

Where changes to the conditions given in the submission are required (i.e. Contractors, completion dates, increase in workers), a revised Annexure 1/2 must be submitted to the Department of Labour. The completion date is to include the defect and liability period. A copy of the notification form and any further submissions/correspondence must be kept in the H&S file.

6.1.2 Health and Safety Plan Framework

The H&S aspects related to the project outlined in the previous sections are to be taken into account when drawing up the H&S Plan. The PC is required to demonstrate competence by providing an H&S system that will address the requirements of the project.

The current legislative requirements, SANS codes and any other standards that may guide practice are to be taken into consideration. The following aspects must be addressed in the H&S Plan as they play a role in reducing the overall risk of a particular activity, or section of the project. The H&S Agent may from time to time request additions or systems as they relate to the works or legislative requirements at the time.

The PC is to prepare a site layout drawing to indicate at least the following:

- The positions of site offices of all Contractors, toilets, drinking water and worker rest areas;
- Indicate the positions of emergency personnel and equipment (fire, first aiders, first aid posts);
- Protection of plant and pedestrians, indicate parking, and
- Storage areas (materials and equipment, waste etc.)
- Access and egress to site for deliveries and intended temporary traffic management
- Emergency assembly point

Such layouts are to be updated regularly throughout the project.

6.1.3 Appointment of Competent Site Personnel

The CEO (OHSA S16.1) of the PC will take overall responsibility for the appointment of competent site staff for the duration of the project. Should the CEO not be personally involved in the project, the H&S responsibilities are to be delegated to the Contract Manager (OHSA 16.2). Knowledge and training in H&S is required, and certificates indicating H&S training as well as experience to be included in CVs.

All other legal appointments are to be made with relevance to the type of work required and kept current with the project programme. The construction team is to ensure the appointed H&S Officer is kept up to date with all planned activities, to ensure all H&S requirements are met.

All construction/technical method statements are to be generated by senior site personnel, and the appropriate risk assessments developed therefrom in conjunction with the H&S Officer.

The Occupational Health and Safety Plan shall include the following, but is not limited to the following key appointments:

6.1.4 Construction Supervision

Competent supervisors will be appointed to manage part or all of the works and have training and/or experience in the area of responsibility. All site supervisors must show evidence of appropriate training in H&S, and an understanding or training in areas of responsibility (i.e. risk assessments, method statements etc.).

Curriculum Vitae (CVs) are to be submitted for approval by the Designer, and/or Client. The Supervisor will be held responsible for the safety of working teams and subordinates, housekeeping and stacking and storage of materials.

6.1.5 Construction Health and Safety Officer

The PC will employ at least one competent, full-time, or part time H&S Officer for the duration of the contract depending on the nature of the hazards on site and subsequent risks. The H&S Officer's CV is to be submitted for approval by the H&S Agent or the Client, at time of tender. The PC is to ensure adequate resources are provided in order to undertake all responsibilities (i.e. mobile phone, computer and internet access, vehicle etc.) Qualifications shall include at least Grade 12, SAMTRAC/NEBOSH/Diploma in H&S qualifications or similar together with additional appropriate short courses (ie. Fall Protection Developer, Risk Assessor, Basic Firefighting and First Aider Level 1) with exposure to civil engineering and building that is appropriate given the level of project complexity and registration with SACPCMP. An in-depth knowledge of legislative requirements and the application thereof is required. The site supervisor may not act as the H&S Officer.

The H&S Officer/s will be held responsible for all H&S on the project.

- Senior site staff and supervision, Contractors are to follow systems, instructions etc. given by the H&S Officer at all times;
- No new workers or Contractors may commence work without approval or following the H&S plan as submitted, and
- No inductions of Contractor staff until the H&S documentation is approved by the H&S Officer.
- The H&S Officer/s may not be removed or replaced without the approval of the H&S Agent, nor may the site be left unattended for more than 1 day without adequate, competent cover.

A monthly report of all H&S activities and incidents is required by the end of the first week of each month, or at a date agreed to by the H&S Agent/Client and the H&S Officer. An example of the monthly report is attached as an *Annexure D*.

The H&S Officer will be responsible for collating the H&S documentation at the close out of the project in electronic format. A list of the typical aspects that should be provided is available as *Annexure B* to this document. The PC is to ensure that all Contractors documentation follows the same requirements and closed out H&S documentation must be completed and be available with the close out of the main contract.

Failure to do so will be considered a serious offence and penalties applied.

6.1.6 Traffic Safety

The H&S Officer will be responsible for ensuring that daily traffic management is adequately managed and additional care must be taken where workers and public interface.

No worker may be transported in, or on the rear of construction vehicles (bakkies included), or with plant and materials to, on, or from site. The number of passengers in any vehicle is limited to what is stated on the license disc. Vehicles used to transport workers to, from, or on site, shall have secure seats and be covered. No canopies may be used.

Tenderers must indicate in their OHS plans what type of transport is envisaged and how this will be managed.

Penalties will be issued for non-compliances noted.

6.1.7 Health and Safety Representatives and H&S meetings

H&S Representatives representing workers and Contractors are to be appointed following the startup of the project, irrespective of the number of workers on site. The appointed H&S Representatives are to be actively involved with H&S and will assist the H&S Officer and site management in meeting legislative duties.

The H&S Officer shall further ensure that H&S is discussed at all internal production or progress meetings. Issues arising from the H&S Agent audits are to be discussed, as well as all H&S related issues.

Minutes are to be kept for all H&S interventions and meetings. Failure to do so will be deemed to be a moderate offence.

6.1.8 Appointment of Competent Contractors

The Principal Contractor is to ensure compliance with the Clients minimum standards and all legislative requirements. The same H&S standards required of the PC are to be applied to all Contractors. An index of all Contractors and Suppliers is to be on file and kept updated at all times. The PC is to ensure there is sufficient funding for H&S compliance by each Contractor.

The following minimum aspects are applicable to any Contractor appointed:

- The H&S Officer is to ensure a Contractors appointment and approval of H&S documentation at least seven (7) working days prior to commencing work.
- No Contractor may work under the PCs Compensation registration number. If required, the PC may assist SMMEs with their registration with the Compensation Commissioner. However, such Contractors will not be able to commence work until proof of registration or Letter of Good Standing has been received.
- No work may commence without Mandatary agreements between parties in place.

The following aspects are applicable to Suppliers or short-term works (surveying, repairs, servicing, deliveries etc). Cognisance is to be taken of the level of risk involved and the H&S Officer is to ensure the level of H&S documentation is appropriate:

- Mandatary agreements in place
- Letter of Good Standing
- Method statements and risk assessments
- Available information relative to:

- Load testing and registers for cranes or lifting devices
- Medical certificates of fitness
- Material Safety data sheets (MSDSs)

Failure to provide written approval of H&S documentation will be considered a serious offense, and could result in aspects of, or all the activities being stopped, and penalties implemented.

GENERAL RISK MANAGEMENT

7.1 Health Risks and Medical Surveillance

The appropriate MSDSs are to be obtained for all products and used to develop the H&S documentation as they relate to the works. Many of the processes may be labour intensive and ergonomic risks are to be noted. All workers (including Contractors) are to be included in the medical surveillance programme.

Workers will be exposed to noise, dust, and physical risks from extended periods of work of a repetitive nature, materials specified and the general nature of the works.

All workers (including those of Contractors) are required to be in possession of a medical certificate of fitness prior to commencing work.

Full medical records are not to be placed in the H&S file. Given the potential health risks the following aspects are to be included in each medical surveillance intervention:

- Full medical, surgical and occupational history;
- Full physical examination of all systems; and
- Referral if required for the management of identified health issues that may affect the worker.

Specific testing for existing conditions and limitations relative to exposure could include, but are not limited to:

- Audiometry (hearing tests); and
- Any other tests identified as relevant from chemical or specifically identified risks of exposure

Failure to do so will be considered a serious offence.

7.2 Noise Risks

All plant from plant hire companies (suppliers) or that of the PC is to be compliant with the Noise Induced Hearing Loss Regulations. Plant identified that has not been tested and marked for noise emissions will result in having to be tested at the Contractors or PCs expense. Failure to do so within a reasonable time period will result in such plant being removed from site.

Audiometric testing of all workers is noted as required in the medical surveillance programme for all permanent workers prior to work commencing. Temporary labour working in identified noise areas will require testing if the noise levels are indicated on plant or through processes as greater than 85dB. Audiometry records are to be available in the H&S file.

Suitable SANS approved hearing protective equipment shall be issued and worn where noise levels are identified as equal to or greater than 85dB.

Failure to do so will be considered a serious offence.

7.3 Emergency Procedures

A simple emergency plan and procedure that is appropriate to the risks is required prior to commencement on site. It is advised that the system should be simple and easy for any worker to follow. The plan may be adapted should new information or risks are identified.

The procedure shall detail the response plan in relation to the works, and include at least (*but are not limited to*) the following key elements:

- Appointment of a competent emergency response co-ordinator
    - Site Camp Fire;
    - Public injury, Motor vehicle accidents;
    - Falls from heights;
    - Serious injury to workers (medical or work-related); and
    - Any other major risks identified during risk assessments

The emergency plan is to ensure the inclusion of local service providers where possible. Such arrangements should be made with these persons prior to the commencement of the project. The general principals of emergency management are to be applied as it applies to the hierarchy of control and management.

7.4 First Aiders and First Aid Equipment

At least 1 first aider will be trained to Level 3. First aiders shall be available and accessible on site at all times and be able to work as a team when responding to any emergency on the project.

Contractors are expected to ensure compliance and provide/manage their own first aiders and equipment. The number of First aiders will be determined by the complexity and exposed risks of the project, not numbers of workers

Appropriately stocked first aid kits are to be available at all times and to assure continual availability and access on site.

7.5 Fires and Emergency Management

The emergency plan is to include the risk of fire on site and related to any specific activities where gas, welding, cutting etc. occur.

Fire extinguishers will be appropriate for the risk and in sufficient numbers to deal with the type of fires that could occur. All mobile plant is to have fire extinguishers. Hot work permits are required for any such activities.

7.6 Incident Management and Compensation Claims

All incidents and accidents are to be investigated. All serious incidents involving any form of disabling injury or fatality are to be reported to the Designer /Client /H&S Agent immediately. This shall be confirmed in writing following the incident. Full details are to be included in each site meeting or when the Client visits site. A summary of incidents is to be included in the monthly report.

Failure to comply with emergency provisions will be considered a serious offence, and the operation or project may be stopped if deemed inadequate for the work at the time of assessment or site inspection.

7.7 Personal Protective Equipment (PPE) and Clothing

The PC is to provide a procedure as an addendum to indicate how PPE is managed within the Company.

The wearing of the identified SANS approved PPE at all times is non-negotiable. The PC shall ensure that all workers (Including Contractors) are issued with and shall wear:

- Hard hats;
- Protective footwear;
- Overalls that ensure worker visibility;
- Eye protection;
- Hearing protection;
- Reflective jackets (no bibs)
- Respiratory protection (minimum of FF2), and
- Any other necessary PPE identified from MSDSs and/or risk assessments.

Adequate quantities of PPE shall be available. This shall include necessary PPE for visitors. The procedure for managing PPE is to be in a formal procedure submitted with the H&S plan for approval.

Any person (*including Client, Designers etc.)* found on site without the necessary PPE will be removed from site until the PPE is supplied and worn.

Failure to comply will result in penalties being applied.

7.8 Occupational Health and Safety Signage

On-site H&S signage is required. Signage shall be posted up at fixed or temporary working areas, or other potential risk areas/operations. These signs shall be in accordance with the requirements of the General Safety Regulations or SANS requirements as amended. Signage is to be noted on the site drawings indicating where fixed/temporary signage is required.

Temporary signage is to include (*but not be limited to*) the following:

- 'Report to site office'/ 'Warning: Construction Site – Keep out' or similar;
- 'Site office' (if relevant);
- 'hard hat area' or other PPE requirements noted;
- First aid box positions (*including vehicles*); and
- Fire extinguishers.

Signs shall be posted at areas of work on site indicating that a construction site is being entered and that persons should take note of H&S requirements.

Failure to comply will result in penalties being applied.

7.9 Induction of Employees and Visitors, General H&S Training

A simple, formal induction programme is to be submitted as an addendum for approval with the H&S plan. Inductions must be carried out for all workers and visitors (*including Client, Designers*) to the site.

Pre-task training is required to ensure workers are familiar with the risks and H&S measures of the work or tasks to be done. Such training is to be done at least daily. A record of inductions and pre-task training is to be kept in the H&S file.

Any person found on site without proof of induction will be removed from site until the proof is supplied and, and a penalty issued per non-compliance.

7.10 Management of Plant and Equipment

Close control of plant and equipment is required, including that of Contractors.

Daily monitoring of all plant and equipment is required prior to commencing work. Full lists of hired and own plant are to be available at the H&S Agent's/Client audit. All daily inspection records are to be kept in the H&S file or Contractors where plant and equipment is brought onto site. Registers are not to be more than 1 week behind.

Only competent, medically fit plant operators are to be used. Medical certificates of fitness are required for all operators. Any plant or slings used to lift plant or material require annual load testing by an AIA, and all certificates must have the testers LMI/E number. Operators are to be adequately trained and certified to operate mobile cranes or crane trucks. Certificates and registers are to be placed in the H&S file.

Failure to do so will be considered a serious offence.

7.11 Excavations

A procedure for managing excavations is to be provided as an addendum to the H&S plan describing how excavations are to be managed.

Excavation method statements are to be approved by the Designer and associated risk assessments are required. Designs by competent persons are required where ground conditions are deemed to require shoring.

A competent person is to be appointed for managing all excavations. A permit system is to be available and used for all excavations. All equipment and ground conditions are to be checked daily and prior to work commencing.

Excavations should preferably not be open beyond what can be closed daily. Where excavations need to remain open, all excavations are to be properly protected. Adequate stakes with 1m high demarcation and berms/spoil are required to be a safe distance from the edge of the angle of repose. Danger tape may not be used to demarcate excavations. Cognisance is required of the surrounding area and increased levels of protection are required where work is in the vicinity of members of the public.

Work will be stopped and penalties applied to any work in excavations that is not compliant.

7.12 Working at heights

A Fall Protection Plan (FPP) is to be available and supplied as an addendum to the H&S plan.

The FPP must be appropriate for the project. Method statements, appropriate risk assessments, safe work procedures and training are to be available prior to work commencing.

Construction drawings shall be required for all temporary structures as they relate to the project. The drawings shall be accompanied by full calculations, design loads and any relevant test results as required by the SANS code, and ensure adequate allowance for the development of appropriate documentation and training. All drawings are to be checked and signed by a competent structural engineer (registered with ECSA).

The focus for working at height shall include fall restraint systems where possible except during assembling or dismantling top components or where it is not deemed safe. The relevant SANS codes are to be applied as they apply to the works and the project, such as:

- SANS 10085
- SANS 50355
- SANS 50361
- SANS 50355

Should part of the works be contracted out, competent Contractors are to be appointed and submit documentation according to the project requirements. The PC is to note if such work is to be contracted to specialists in the H&S Plan. The plan is to be developed by and work managed by a competent person for the duration of the project. The following aspects must be included:

- The public are to be protected at all times by way of hoarding, barricading or fencing
- Notices to be posted
- Restrictions or stoppage when weather conditions are deemed hazardous
- Permit system for working at heights
- Prevention of falling tools or equipment
- Link to emergency plan regarding rescue
- All workers are to be in possession of valid certificates of fitness that extend for the duration of the works. Note the requirements in the section relating to medical surveillance.
- Registers and all relevant documentation are to be placed in the H&S file.

Work will be stopped and penalties applied to any work at heights that is not compliant.

7.13 Cranes and lifting equipment

Should any form of lifting device or crane (fixed or mobile) be used during the project for deliveries, moving of supplies or equipment, the appropriate documentation must be made available. Method statements, risk assessments, safe work procedures and training are to be available prior to work commencing. A procedure for managing loads and lifting must be made available as an addendum to the H&S Plan.

7.14 Temporary Works (Scaffolding, support work, formwork)

Temporary works must be properly designed and signed off by a competent person who has sufficient experience in the design of the type of temporary work in question to be able to assess the design. The appropriate competent persons are to be appointed to manage and monitor such works to the satisfaction of the Engineer and H&S Agent. Records and registers are to be properly completed and kept in the H&S file. If temporary works are to be erected by a Contractor, this must be notified to the Designer/H&S Agent.

Failure to do so will be considered a serious offence.

7.15 Auditing

Frequency of external auditing by the H&S Agent or Client will be as agreed with the Client and Designer but will at least conform to the requirements of the Construction Regulations. The site will be inspected and the documentation audited relative to the activities and H&S plan. The H&S Officer of the PC must accompany the Client, or the H&S Agent, on all audits and inspections. Not all audits will be, or need be announced.

The PC will ensure that all their Contractors are audited at a frequency determined by the H&S Agent or Client. Audit frequency may be increased if Contractors are not performing adequately. Audit results will be acted upon and non-conformances and penalties issued where deemed appropriate. The Client, Designer or H&S Agent may act or require further outcomes if non-compliances are noted or unsafe acts are noted on site.

Internal audits are to include site conditions as well as ensuring H&S files are appropriate, and compliant. Comprehensive audit reports are to be made available, the format of the audit reports are to be acceptable by the H&S Agent.

The PC will be audited using a template as supplied in the tender document. The audit template will be adjusted from time to time relative to the activities on site. A similar process is to be used by the PC when auditing their Contractors on site. Compliance with legislative requirements and the systems provided by the PC to manage the H&S on site will be measured. Full compliance is required. Time limits for corrective actions will be set and must be adhered to.

Failure to address findings or non-conformances will be considered a serious offence.

7.16 Mechanical installations

All mechanical installations are to be carried out in conformity with the manufacturer's instructions. Method statements and risk analyses must be compiled for each type of installation. A competent person must be designated to supervise the work.

7.17 Communication on Site

All H&S communication during the project between the H&S Agent and the PC will be done through the Engineering Consultant and be in writing, including the issue and responses to non-conformances and H&S audit results.

Failure to address issues timeously will be considered a serious offence.

7.18 Care of Workers on Site (Welfare)

Adequate toilets, clean, safe drinking water and decent shelter will be afforded workers at all times. Toilets will be within reasonable distance of workers, or placed with each working team in safe, with reasonable privacy. Hand washing facilities will be provided. Arrangements made

where existing facilities are shared with existing users must be made in writing and placed in the H&S file.

Failure to ensure compliance will be considered a serious offence.

7.19 Discipline, Alcohol and Substance Abuse

All employees (management included) are to follow instructions given in the interest of H&S. A disciplinary procedure is to be developed and disciplinary action is to be imposed on those who do not follow such instructions or company rules or policies.

No person is allowed to work or access site if under the influence of alcohol or other substances that could impact on their own or others safety. The PC is to have a drug and alcohol policy available to manage such instances.

These requirements are applicable to any employee of any organization providing services on site. Penalties may also be applied by the Client, OHS Agent or Engineer.

7.20 Electrical Equipment

In addition to the requirements of the Electrical Machinery Regulations and the General Machinery Regulations any electrical distribution board used for construction work shall be fitted with suitable earth leakage protection. Leads must be properly and firmly connected. Plugs and sockets shell be in good and safe condition.

All electrical apparatus, other than electrical hand tools, shall have a physical “lock out” system which will prevent any operation other than that authorized by a supervisor. A “lock out” sign shall be displayed when the apparatus is not in use. Method statements and safe work procedures will be required for all work involving electrical apparatus.

7.21 HIV and AIDS Programme

The PC shall reduce the risk of transfer of HIV between and amongst construction workers and the local community, raise awareness amongst construction workers of the risk of infection with HIV, promote early diagnosis and assist affected individuals to access care and counselling by:-

- making condoms that comply with the requirements of SANS 4074 available for the duration of the contract to all construction workers at points on the site which are readily accessible and suitably protected from the elements
- either by placing and maintaining HIV/AIDS awareness posters of the size not less than an A1 in areas which are highly trafficked by construction workers or providing construction workers with a pamphlet in languages largely understood by the construction workers which reinforces the outcomes of the HIV/AIDS awareness programme
- encouraging voluntary HIV/STI testing
- providing information concerning counselling, support care of those that are affected

7.22 Safety Conflict

Where any conflict exists between the requirements of this PSHSS, the Site Rules or Statutory Requirements/Regulations the higher standard must apply unless such conflict is brought to the attention of the Client or H&S Agent and a direction provided. The PC is deemed to have allowed for the higher standard.

The PC is legally responsible for ensuring that he conforms to all applicable aspects of the Occupational Health and Safety Act 85/1993 and Regulations (OH&S Act) and other relevant Acts and Regulations. If in dispute with the PSHSS and other legislation the most stringent requirement must apply.

HEALTH AND SAFETY FILE

The documentation submitted and approved following the awarding of the contract will be used to form the H&S file. The H&S file is required to be laid out in a logical manner, and documentation filed within the file is to be easily accessible.

The following completed information shall be included (*but not be limited to*) as part of the index:

- The PSHSS;
- The H&S Plan and the approval by Client;
- Appointment by Client;
- Mandatary agreement with Client;
- Notification of construction work;
- A record of all working drawings, calculations and design where applicable;
- Detailed list of Contractors with contact details, appointments, Mandatories etc., H&S specifications issued;
- Record of Competencies (CVs) and appointments;
- Training Records;
- Permits;
- Method statements;
- Risk assessments;
- Safe work procedures;
- Emergency and injury management;
- Material Safety data sheets
- Medical surveillance records;
- Registers; and
- Records of audits, minutes etc.
- Plant lists
- Temporary electrical installations
- Employee records (*who is on site*)

NON-CONFORMANCES

Should, at any time, the works, or part of the works, be stopped due to unsafe acts or non-compliance with the Clients or PCs H&S Plan; neither the PC nor any other Contractor shall have a claim for extension of time or any other compensation.

The following constitute examples of the types of non-conformances that will attract penalties:

Minor: **Penalty: R50/count**	**Medium:** **Penalty: R500/count and a non-conformance**	**Severe** **Penalty: R5000/count, a non-conformance and/or activity stoppage**
Non-use of PPE supplied	Toilets not supplied or regularly serviced; lack of drinking water	Contractors working without Health and Safety Plan approval
Non completion of registers for plant and equipment on site	Contractors not audited	Workers transported in contravention of the OHS plan or legal requirements
Lack of H&S signage at work areas	Working without training or the appropriate, approved H&S method statements	Invalid Letters of Good Standing
Tools and equipment identified in poor condition during inspections	Legal non-conformances identified during the previous audit and not addressed within the agreed time frame	Non-compliance with traffic accommodation requirements: layout or physical conditions
	No monthly OHS report at site meeting to report on	Any serious breach of legal requirements
	No certificates of fitness for workers as required	
	Working without approved method statements	

9.1 Failure to Comply with Provisions

Failure or refusal on the part of the PC or their Contractors to take the necessary steps to ensure the safety of workers and the general public in accordance with these specifications or as required by statutory authorities or ordered by the Principal Agent (PA), shall be sufficient cause for the PA to apply penalties as follows:

(i) A penalty as shown in the Table above shall be deducted for each and every occurrence of non-compliance with any of the requirements of the PSHSS.

(ii) In addition a time-related penalty of R500,00 per hour over and above the fixed penalty may be deducted for non-compliance to rectify any non-conformance within the allowable time after a site instruction to this effect has been given by the PA. The site instruction shall state the agreed time, which shall be the time in hours for reinstatement of the defects. Should the Contractor fail to adhere to this instruction, the time-related penalty shall be applied from the time the instruction was given.

MEASUREMENT AND PAYMENT

The payment items for Occupational Health & Safety are contained in the Bill of Quantities. The same rules are applicable in respect of the pricing of these items as for every other payment item. Attention is drawn to the Pricing Instructions in this document.

Item and Unit

C.01 Preparation of Contractor's Project Specific Health and Safety Plan. (Lump Sum (L.S))

The rate for this item must cover all expenses incurred in preparing the Contractor's project specific Health and Safety Plan as required by the Client's project specific Health and Safety Specification in this document.

C.02 Principal Contractor's initial obligations in respect of the Occupational Health and Safety Act and Construction Regulations. (Lump Sum (L.S))

The full amount will be paid in one instalment only when the Client's Agent has verified and approved the following

(a) The Principal Contractor has notified the Provincial Director of the Department of Labour in writing of the project, Annexure 2 to the Regulations.
(b) The Principal Contractor has made the required initial Appointments of Employees and Contractors.
(c) The Client has approved the Principal Contractor's project Health and Safety Plan.
(d) The Principal Contractor has set up his Health and Safety File.

C.03 Principal Contractor's time related obligations in respect of the Occupational Health and Safety Act and Construction Regulations. (Month (M.Th.))

The amount shall represent full compensation for that part of the Principal Contractor's general obligations in terms of the Occupational Health and Safety Act and Regulations which are mainly a function of time. Payment will be made when the Client's Agent has verified the Principle Contractor's compliance as part of the audit. This will include the updating and administration of the Health and Safety file.

C.04 Provision of Personal Protective Equipment (PPE) as listed in the Bill of Quantities. (Number (No))

The rates for these items shall include for the procurement, delivery, storage, distribution and all other actions required for the supply of PPE to the employees of the Principal Contractor, full or part time, requiring them. Sub-Contractors are responsible for their own costs in this regard. Any items of PPE not included on the list will be paid for only after the PA has agreed to their acquisition.

Items listed will include, among others which may be noted, are: hard hats, reflective vests, high visibility overalls, protective footwear, fall arrestor harness, gloves, ear muffs, earplugs and dust masks of appropriate type. Normal items such as standard overalls, waterproof clothing, gum boots and standard workshop safety equipment such as welding masks and goggles will not be paid for.

Payment will be based on the issues register for PPE as kept by the Construction Health and Safety Officer, backed up by paid invoices if requested.

C.05 Provision of a Full/Part Time Construction Health and Safety Officer (Month)

The Tender sum shall include for the cost of a Construction Health and Safety Officer on a fulltime or part time basis.

C.06 Costs of Medical Surveillance (Unit (No))

This item shall cover all costs in involved in the obtaining of baseline medical examinations of temporary labour, including operators for mobile plant as contemplated in CR 23(d) (ii); for temporary workers and workers exposed to noises at or above the limits given in the Noise-induced Hearing Loss regulations, as stipulated.

Workers in the permanent employ of the Contractor will only be paid for if their certificates require updating.

C.06 a) Initial (baseline) medical examinations, including audiometric and lung function testing.

C.07 Induction Training (Unit (No))

This item shall cover all costs incurred for the health and safety inductions as set out in Regulation 7 of the Construction regulations and the proof of induction required. Payment will be made on the figures contained in the induction section of the Health and Safety File.

C.08 Provision of First Aid Boxes. (Unit (No))

The rate for this item shall cover all costs incurred in the provision and maintaining of first aid boxes.

C.09 Establishment of noise levels (Unit (No))

This item shall cover all costs involved in the establishment of noise zones in terms of Regulation 9 of the Noise-induced Hearing Loss Regulations. Where a zone has previously been established for a particular item of plant within the last two years, the test need not be repeated but must be kept valid for the duration of the Contract.

C.10 Submission of the Health and Safety File. (Lump Sum)

Expenditure under this item shall be made in accordance with the general conditions of contract.

This amount will be paid only once the Principal Contractor has met all his obligations in respect of the Occupational Health and Safety Act and the Construction Regulations and has submitted his Health and Safety File complete as envisaged on this specification to the Client's satisfaction. This must be done prior to the issue of a Certificate of Completion.

ANNEXURE A

H&S AGENT AUDIT SHEET
EXAMPLE OCCUPATIONAL HEALTH AND SAFETY AUDIT DOCUMENT

PROJECT NAME:	
CONTRACT NUMBER:	
HEALTH AND SAFETY AUDIT No:	
CONDUCTED BY :	
DATE :	

EXECUTIVE SUMMARY

INTRODUCTION AND OVERVIEW

Scoring:

The audit has a scoring schedule, which will be used to deem compliance to what is available on site, and what the appropriate systems need to be to match them. The contractor should aim for a score of 3 on each aspect included in the audit. A low score could result in part or all of the work being stopped until compliance is reached.

Scoring schedule	
If the answer is **"No"** the rating will be 0	
If the answer is '**not applicable'** it will be noted as n/a	
If the answer is **"Yes"** the following ratings are applicable	
1	Requirements partially met and no implementation.
2	Requirements partially met and partially implemented
3	Requirements fully met and partially implemented
4	Requirements fully met and fully implemented
5	Requirements and implementation exceeds expectation

Key Abbreviations:

Health and Safety	H&S	Driven Machinery Regulations	DMRs
Occupational Health	OH	Regulations for Hazardous Chemical Substances	RHCSs
Construction Regulations	CRs	Pressure Equipment Regulations	PERs
General Safety Regulations	GSRs	General Administration Regulations	GARs
Explosive Regulations	ERs	South African National Standards	SANS
Noise Induced Hearing Loss Regulations	NIHLs	South African Road Traffic Safety Manual	SARTSM
Facilities Regulations	FRs		
South African Bureau of Standards	SABS		
Occupational Health and Safety Act	OHSA		

Provide a summary of site inspection, significant findings of the site inspection and the audit.

CORE LEGAL RECORDS ON SITE:

This list in not conclusive – to be updated monthly relative to works in progress. However, the H&S Officer is to be pro-active and pre-empt requirements with the Construction Supervisor (Site Agent). The content will be linked to the physical conditions, processes and activities noted on site, or programme.

ITEM	Legal /SPEC Ref	RECORDS TO BE KEPT	SCORE	COMMENTS	By whom	Completion Date	Contractor Close out
1.		Updated project **H&S Organogram**					
2.	OHSA S. 16 (1) and (2)	CEO and subordinate (if required) • Proof of Competency provided					
3.	CR 8 (1) and (2)	Designation of Construction Manager and Subordinate Person(s) • Proof of Competency provided					
4.	OHSA S. 17; GAR 7	• H&S Representatives appointed • Monthly inspections completed • Representation from Contractors					
5.	OHSA S. 18; GAR 5	• H&S Committee appointed • Minutes on file • H&S representative's reports discussed • Incidents discussed • Signed by Chair					

ITEM	Legal /SPEC Ref	RECORDS TO BE KEPT	SCORE	COMMENTS	By whom	Completion Date	Contractor Close out
		• Evidence of minutes noted					
6.	GAR 4	Copy of OH&S Act (Act 85 of 1993) available on site					
7.	CR 5(j); 7(c)(iv)	Written proof of registration / **Letters of good standing** available on Site					
8.	OHSA S.37.2	**Copy of the Mandatary (S37.2) agreement between the PC and Client**					
9.	OHSA S.37.2	**Mandatary agreements** between PC and contractors					
10.	CR 3(1); 4(1)	**Notification to Provincial Director – Annexure 1/2** Available on site					
11.	CR 5(1)(m) 7(1)(b)	• Copy of Principal Contractor's Health & Safety Plan Available on request. • Letter of approval from Agent. • Health & Safety File opened and kept on site (including all documentation-required in					

ITEM	Legal /SPEC Ref	RECORDS TO BE KEPT	SCORE	COMMENTS	By whom	Completion Date	Contractor Close out
		respect of the OHSA & Regulations) • Available at all times					
12.	CR 7(1(b)	**Copy of Principal Contractor's Health & Safety File provided to Contractors** • Letters of approval for each contractor on file • List of Contractors on site • Verified monthly by Agent					
13.		**Copies of technical method statements** approved by Designer • Register available, signed by Designer					
14.	CR 9(1) OHSA CR 9(3)	**Risk Assessments**: • Up to date and available on site for inspection • Review and monitoring programme adhered to • Workers trained in risk assessments					
15.	CR9(1)(c)	**Safe work procedures Procedure**					

ITEM	Legal /SPEC Ref	RECORDS TO BE KEPT	SCORE	COMMENTS	By whom	Completion Date	Contractor Close out
		• List of available SWPs • Workers trained in SWPs • Proof of training verified					
16.	OHSA S. 13 CR 7(5)(6)	**Induction programme available** • Proof of **induction** training available					
17.	CR 6(1)(2)	**Structural information from Designer**: • Geo-science technical report • Design loading of the structure • Methods & sequence of construction • Design risk assessment • Amended H&S Specification • Temporary Works Design					
18.	CR 12(1)(3)	**Temporary Works** • Appointment of temporary works designer • Proof of Competency provided • Approved temporary works drawings • Temporary work inspection register					

ITEM	Legal /SPEC Ref	RECORDS TO BE KEPT	SCORE	COMMENTS	By whom	Completion Date	Contractor Close out
		• Competencies of erectors of temporary works • Construction method statements					
19.	CR 13(1)(2)	**Excavations:** • Competent persons appointed • CVs available • Depth of excavations on site • Shoring in use • Registers in line with open excavations noted at site inspection					
20.	CR 13(f) GSR 13A	**Ladders**: • Competent person appointed • Registers kept • Registers for ladders noted on site					
21.	CR 16(1)	**Scaffolding: SANS 10085** • Competent Erector(s) and Inspector appointed • Proof of Competency provided • Registers in place					
22.	CR 23	**Construction Vehicles:**					

ITEM	Legal /SPEC Ref	RECORDS TO BE KEPT	SCORE	COMMENTS	By whom	Completion Date	Contractor Close out
		• Appointment of competent operators • Plant Management: • Registers on file noting daily inspections • Plant and machine lists available • Inadequacies noted on site • Transportation of workers • Registers for sample of vehicles noted on site					
23.	CR 24	**Temporary Electrical Installations and Machinery** • Competent Person appointed • Proof of Competency provided • Updated weekly installation inspection registers in place • Updated daily inspection registers in place					
24.	CR 25	**Flammable Liquids:** • Competent Person appointed for inspections • Proof of Competency provided • Inspection registers in place					

ITEM	Legal /SPEC Ref	RECORDS TO BE KEPT	SCORE	COMMENTS	By whom	Completion Date	Contractor Close out
25.	CR 27, ER 6 GSR 8	**Housekeeping, Stacking & Storage Supervisor:** • Appointed per work area • Proof of Competency provided • Include site conditions • Spoil areas • Register available per area					
26.	GSR 2	**PPE:** • included in Risk Assessment • PPE used and enforced • Records of Issue kept • Training to use (Induction) • Registers for condition checks					
27.	RHCSs CR 7; 23 GSR 4	**Hazardous Chemical Use and Storage** • Competent Person/s appointed • Proof of Competency provided • Risk Assessments include use of HCSs • Register of HCS kept/used on Site • Flammable Store • Bulk diesel storage • Material Safety Data Sheets on file and utilised					

ITEM	Legal /SPEC Ref	RECORDS TO BE KEPT	SCORE	COMMENTS	By whom	Completion Date	Contractor Close out
		• Other					
28.	GSR 3	**Emergency management:** • First aiders available through project • Level 1 • First aid boxes through site • Evacuation procedures • Registers available (noted on site)					
29.	GAR	**Incident Management:** • Emergency co-ordinator appointed • Proof of Competency provided • Emergency plan appropriate • Emergency level included in Risk Assessments • Workers trained • Incident reports available and complete					
30.	CR 1 (g), 7(8)	**Medical Surveillance Programme** • All employee records					
31.	CR 30/ FRs	**Welfare Facilities:** • Toilets available where crews are working/clean					

ITEM	Legal /SPEC Ref	RECORDS TO BE KEPT	SCORE	COMMENTS	By whom	Completion Date	Contractor Close out
		• Clean potable water available • Adequate eating facilities					
32.	SANS 1921-6	**HIV AND AIDS PROGRAMME** • HIV and AIDS Policy and plan available • Condoms available • Peer review programme available • Ongoing training of workers					
29.		**Other**					

RESPONSIBILITY	SIGNATURE	DATE
H&S AGENT SIGNATURE:		
PC SIGNATURE:		
DESIGNER SIGNATURE:		
CLIENT SIGNATURE:		

ANNEXURE B

CLOSE OUT REQUIREMENTS

The H&S files for the Principal Contractors and all Contractors require closure and handover to the Client at the completion of the project. The following list is an example of what should be included but is not exhaustive. The OHS Agent or the Client may require further information at the time of completion and the Principal Contractor is to ensure that all instructions are met. Documentation would include all records from the start of the project. Daily or monthly plant inspection records are not required unless they are related to an accident. All records to be in electronic format and submitted to the OHS agent for approval in adequately formatted lists and folders. Layout should be logical and in the same order as in the site files.

Health and Safety close out file requirements include:

a) Client H&S Specification
b) Principal Contractor's OHS Plan(s)
c) Organograms
d) Legal Appointments
e) List of all employees employed on a permanent or contractual basis over the duration of the contract
f) Notification to Department of Labour of commencement of work
g) Letters of Good Standing for the Project
h) Full files for all Contractors as well as their close out reports
    - List of Contractors
    - All employees employed on a permanent or contractual basis over the duration of the contract
    - Letters of Approval of Contractors
    - Mandatary Agreements
    - Letters of Good Standing
    - Appointments
i) Incident Records
j) Non- Conformance records
k) Agent's Audits
l) Method Statements
m) Risk assessments
n) Safe work procedures
o) Medical surveillance certificates of fitness. Medical records are to be kept according to the OH&S Act as amended
p) All drawings for temporary structures (suspended beams/scaffolds etc)
q) All operating manuals for any systems that require ongoing maintenance
r) Copies of test results, policies and procedures for environmental monitoring (silica, noise, dusts etc.)

Defect and Liability Period

The H&S files are to be kept 'live' for the defect and liability period by the Principal Contractor, including those of their Contractors. Any work required during the defect and liability period will require an assessment of the H&S file by the OH&S Agent prior to any work commencing.
A copy drawing records for the as-builts are to be placed on file by the Designers once complete.

ANNEXURE C

NON-CONFORMANCES

HEALTH AND SAFETY SITE INSPECTION NON-CONFORMANCE NO		
AGENT:	**PROJECT:**	
Consultant:	**Date and time:**	
Client	**Area:**	
Contractor:		
ASPECTS NOTED:	**COMMENTS:**	**COMPLETION REQUIRED BY (DATE):**
	•	
	•	
	•	
	•	
	•	
PHOTOGRAPHIC EVIDENCE (if available):		
OTHER:		
The following penalties are to be applied:		
Signature of Designer		
Signature of H&S Officer/Site Agent		
Signature: of H&S Agent		

ANNEXURE D:

CONTRACTORS MONTHLY HEALTH AND SAFETY REPORT

(To be submitted by the end of the first week of each month and be available with each audit)

CONTRACT NUMBER:		PROJECT NAME:	CONTRACT DETAILS:
1	GENERAL ACTIVITIES FOR THE MONTH (detail each area of work)		
2	NUMBER OF WORKERS (permanent and local, contractors)		
3	TRAINING DONE (supplier, no of people, type)		
4	INCIDENTS / ACCIDENT (list number and details, attach reports)		
6	NON-CONFORMANCES (closed out or active)		
7	CONTRACTORS (list, approval status)		
8	AUDITS COMPLETED (internal and external)		
9	CRITICAL ISSUES		
10	GENERAL		

H&S Officer **Signature** **Date:**

Site Agent

Signature **Date:**

ANNEXURE E
RISK ASSESSMENT FORMAT

ACTIVITY		**RA No.**		**Rev No.**	
CONTRACT		**DATE WRITTEN**		**REVIEW DATE**	
	WRITTEN BY	**REVIEWED BY**			**APPROVED BY**
NAME					
SIGNATURE					

RISK REF	ACTIVITY	POTENTIAL HAZARD	RISK	S	H	E	RISK EVALUATION	PURE RISK	CONTROLS MITIGATION	EFFECTIVENESS OF CONTROLS	RESIDUAL RISK	RESIDUAL RISK RANKING

Severity Criteria

Weight No	Hazard Description	Environment	Safety/Health
16	Catastrophic	Irreversible ecological damage	Multiple fatalities due to injury or occupational disease
8	Major	Reversible ecological damage with potential long term impact	Fatality or number of disabilities/disabling diseases
4	Moderate	Ecological disturbance, can be rehabilitated	Disabling injury or occupational illness
2	Minor	Short-term ecological impact. Requires intervention	Minor injuries or exposure requiring medical attention
1	Insignificant	Low impact, natural rehabilitation	First Aid treatment required

Frequency Criteria

Weight No	Hazard Description	Frequency
1	Rare	Less than once every 2 years
2	Infrequent	Every 1-5 years
3	Frequent	Multiple times per year
4	Often	Monthly
5	Consistent	Weekly/Daily

Exposure Criteria

Weight No	Hazard Description	Environmental Exposure	Safety/Health Exposure
1	Minimal	Incident site	A few of the workforce minimal time
2	Restricted	Localised	A few of the workforce, some of the time/some of the workforce minimal time
3	Local	Construction Site Wide	Some of the workforce, some of the time
4	Widespread	Immediate neighbours	Most of the workforce, some of the time/some of the workforce most of the time
5	Extensive	Community exposure	Most of the workforce, most of the time

ANNEXURE F:

TYPICAL BILL OF QUANTITIES FOR OCCUPATIONAL HEALTH AND SAFETY

ITEM NO	DESCRIPTION	UNIT	QUANTITY	RATE	TOTAL
C.01	Preparation of the Contractor's site-specific Health and Safety Plan	lump sum			
C.02	Principal Contractor's initial obligations in respect of the Occupational Health and Safety Act and Construction Regulations	lump sum			
C.03	Principal Contractor's time related obligations in respect of the Occupational Health and Safety Act and Construction Regulations	month			
C.04	Provision of Personal Protective Equipment (PPE)				
	(a) Reflective vests	No			
	(b) Hard hats	No			
	(c) Protective foot wear	No			
	(d) Earplugs	No			
	(e) Dust masks	No			
	(f) Gloves				
	(h) Ear Defenders SABS approved	No			
C.05	Provision of a full time Construction Health and Safety Officer	month			
C.06	Cost of medical certificates and medical surveillance				

	(a) Initial (baseline) medical examinations	prime cost (PC) sum			
	(b) Periodic and exit examinations	prime cost (PC) sum			
	(c) Contractor's charges to allow for handling costs and profit in respect of sub items 13/X.06 (a) and (b)	%			
C.07	Induction training	No			
C.08	Provision of First Aid Boxes to GSR requirements	No			
C.09	Noise monitoring				
	(a) Establishment of noise zones (plant)	No			
	(b) Audiograms (personnel)	No			
C.10	Submission of a Health and Safety File	lump sum			

ANNEXURE G

HARRY GWALA DISTRICT MUNICIPALITY

HEALTH AND SAFETY (H&S) PRE-TENDER REPORT

Tenderers are required to submit a pre-tender H&S plan with their Tender submission.

The following requirements were set in the tender documentation and have been utilized to assess the completeness of the documentation presented with the submission of tenders. These requirements fulfil the requirements of the Client in terms of the Construction Regulations, Regulation 5(1)(h). They are to be read in addition to the Act and Regulations but are not a substitute for them.

The documentation submitted will be used to assess the competence of the tenderer, as required in the CRs, therefore the information submitted needs to be complete and as close as possible to the final product.

The following scores have been used to determine compliance with the pre-tender requirements:
Scoring as follows:

Not supplied or not adequate 0
Supplied and complete 1

If the tenderer has not completed any projects, then Items 4 and 5 need not be supplied. A letter to this effect must be attached.

Tenderers are required to achieve a minimum of 10 out of a total of 17 for their tenders to be considered.

Legal or Specification Reference	Pre-Tender Requirement H&S	Tenderers Response	Max Score	Actual Score
Construction Regulations (CRs) 7(1)	1. A project specific H&S Plan in line with this project specification which will support the CRs, therefore the information submitted needs to be complete and as close as possible to the final product. See check sheet		**1**	
CRs 5(1)(g)	2. Adequate pricing for H&S is also required, and the appropriate section in the BoQ is to be completed. Failure to do so could result in the Tender being regarded as non-responsive.		**1**	
CRs 5(1)(h)	3. A declaration to the effect that he has the competence and necessary resources to carry out the work		**1**	

	safely in compliance with the Construction Regulations 2014;			
	4. At least one copy of minutes of previous Occupational Health and Safety Committee meetings;		**1**	
	5. Incident Investigation Reports for other projects of a similar nature undertaken by the tenderer		**1**	
CRs 9(1)(b)	6. Detailed technical method statements for approval by the ER and for approval by the H&S Agent: a. Site establishment; b. Clearing and grubbing; c. Construction of offices and accommodation, and d. Proposed site layouts		**1** **1** **1** **1**	
CRs 9(1)	7. Appropriate risk assessments: a. Site establishment; b. Clearing and grubbing; c. Construction of offices and accommodation, and d. Proposed site layout		**1** **1** **1** **1**	
CR 9(1)	8. Appropriate safe work procedures a. Site establishment; b. Clearing and grubbing; c. Construction of offices and accommodation, and d. Proposed site layouts		**1** **1** **1** **1**	
	FINAL SCORE		**17**	

TENDER STAGE OHS PLAN EVALUATION

Tenderers will be scored on their response to various facets of the Health and Safety Specification in the Tender Document. Failure to achieve a score of 60 % will render the tender non-responsive				
Proof of the evaluation must be given under the remarks column				
1	**General**	Is the Specification Project Specific? If not then score is 0.		
	Scoring	Response present and satisfactory	1	
		Not present	0	
OHS Act/regulation	**Specification Section**	**Description**	**Max Score**	**Score**
8(1)	6.1.4	Construction supervisor	1	
8(6)	6.1.5	Construction Health and Safety Officer	1	
	7.1	Health Risks and Medical Surveillance		
NIHLR	7.2	Noise Risks	1	
	7.3	Emergency Procedures		
GSR 3	7.4	First Aiders and First Aid Equipment	1	
CR 27	8	Fires and Emergency Management	1	
GAR 8	7.6	Incident Management and Compensation Claims	1	
GSR 2	7.7	Personal Protective Equipment (PPE) and clothing	1	
GSR 2B	7.8	Occupational Health and Safety Signage	1	
CR 7 (5)(6)	7.9	Induction of Employees and Visitors, General H&S Training	1	
CR 23	7.10	Management of plant and equipment	1	
CR13	7.11	Excavations	1	
CR 10	7.12	Working at Heights	1	
CR 8	7.12	Fall protection plan	1	
CR 24	7.13	Cranes and lifting equipment	1	
CR 12	7.15	Temporary works	1	
CR5(1)(0)	7.18	Auditing	1	
DMR/GMR	7.19	Mechanical installations	1	
OHSA 8(2)(j)	7.20	Communication on Site	1	
CR 30	7.21	Care of Workers on Site (Welfare)	1	
	Additional requirements			
	6.1.3	Declaration of competency	1	
Cr 9 (1)		Method statements (SWPs)		
		a) Site Establishment	1	
CR5(1)(g)		Has pricing for OHS been allowed for?	1	
		TOTAL SCORE	24	
		TOTAL PERCENTAGE		

If a section is not applicable, then it must be deleted from the score sheet and the total score reduced.

ANNEXURE I

AGREEMENT IN TERMS SECTION 37.2 OF THE OCCUPATIONAL HEALTH AND SAFETY ACT 1993 (ACT NO. 85 OF 1993)

THIS AGREEMENT is made at _____ on this the _____day of _____in the year _____ between HARRY GWALA DISTRICT MUNICIPALITY (*hereinafter called "the Client"*) of the one part, herein represented by _____in his capacity as _____ and delegate of the Client in terms of the Client's standard powers of delegation.

and

_____

(*hereinafter called "the Mandatary"*) of the other part, herein represented by

_____ in his capacity as _____

and being duly authorised by virtue of a resolution appended hereto as Annexure A.

WHEREAS the Client is desirous that certain works be constructed, viz **CONTRACT NO._____,** and has accepted a tender by the Mandatary for the construction, completion & maintenance of such works and whereas the Client and the Mandatary have agreed to certain arrangements and procedures to be followed in order to ensure compliance by the Mandatary with the provisions of the Occupational Health and Safety Act 1993 (Act 85 of 1993 as updated);

NOW THEREFORE THIS AGREEMENT WITNESSETH AS FOLLOWS:

1 The Mandatary shall execute the work in accordance with the contract documents pertaining to this contract;

2 This Agreement shall hold good from its commencement date, which shall be the date determined in terms of the Form of Offer and Acceptance, or other date decided upon, in the Contract Data, to either;

a) The date of the final certificate issued or as contained in this Volume _____of the contract documents pertaining to this Contract, or

b) The date of termination of the Contract;

3 The Mandatary declares himself to be conversant with the following:

a) All the requirements, regulations and standards of the Occupational Health and Safety Act (Act 85 of 1993 as updated), hereinafter referred to as "The Act", together with its amendments and with special reference to the following Sections of The Act.

i. Section 8: General duties of clients to their employees;
ii. Section 9: General duties of clients and self-employed persons to persons other than employees;
iii. Section 10: General duties of manufacturers and others regarding articles and substances for use at work;
iv. Section 37: Acts or omissions by employees or Mandatories, and

v. Sub-section 37(2) relating to the purpose and meaning of this Agreement.

b) The Contractor shall ensure that he familiarises himself with the requirements of the Clients health and safety specification developed for the project, and that he, his employees and any other Contractors employed during the project comply with them. The Contractor shall ensure that all health and safety documentation required as part of the health and safety plan is maintained for the duration of the project.

4 In addition to the requirements of conditions of contract (as amended by the Contract Data of the contract documents pertaining to this Contract), the Mandatary agrees to execute all the works forming part of this Contract and to operate and utilize all machinery, plant and equipment in accordance with The Act.

5 The Mandatary is responsible for the compliance with the Act by all his Contractors, whether or not selected and/or approved by the Client.

6. The Mandatary warrants that all his own and his Contractors' workmen are covered in terms of the Compensation for Occupational Injuries and Diseases Act 1993 as amended, which cover shall remain in force whilst any such workmen are present on site. A letter of good standing from the Compensation Commissioner to this effect must be produced to the Client upon signature of the agreement.

7. The Mandatary undertakes to ensure that he and/or subcontractors and/or their respective clients will at all times comply with the following conditions:

a) The Mandatary shall assume the responsibility in terms of Section 16.1 of the Occupational Health and Safety Act. The Mandatary shall not delegate any duty in terms of Section 16.2 of this Act without the prior written approval of the Client. If the Mandatary obtains such approval and delegates any duty in terms of section 16.2 a copy of such written delegation shall immediately be forwarded to the Client.

b) All incidents referred to in the Occupational Health and Safety Act shall be reported by the Mandatary to the Department of Labour as well as to the Client. The Client must further be provided with copies of all written documentation relating to any incident.

c) The Client hereby obtains an interest in the issue of any formal enquiry conducted in terms of section 32 of the Occupational Health and Safety Act into any incident involving the Mandatary and/or his employees and/or his Contractors.

d) The Mandatary shall conduct such risk assessments, method statements and safe work practices as may be necessary during the course of the contract and shall ensure that all staff are informed of these. Proof of this shall be placed in the project Health and Safety file.

e) Adherence to the Contractor's Health and Safety plan must be enforced including the application of penalties for non-conformance as set out in the Client's Health and Safety Specification.

In witness thereof the parties hereto have set their signatures hereon in the presence of the subscribing witnesses:

SIGNED FOR AND ON BEHALF OF THE CLIENT: - _____

WITNESS SIGNED: - **1.** _____ **2.** _____

NAME (IN CAPITALS) **1.** _____ **2.** _____

SIGNED FOR AND ON BEHALF OF THE MANDATARY: - _____

WITNESS SIGNED: - **1.** _____ **2.** _____

NAME (IN CAPITALS) **1.** _____ **2.** _____

PART C4: SITE INFORMATION

C4.1 LOCALITY PLAN

The Locality of the site is as per the attached Locality Plan which is part of the list of Tender drawings.

C4.1.1 Access

Table below shows the location of the site which the construction works will be conducted.

No	Description	Location			Local Municipality
		S-Coordinates	E-Coordinates	Ward	
1	Old Underberg Wastewater Treatment Works	29°47'50.72"S	29°29'53.64"E	3	Dr Nkosazana Dlamini Zuma Local Municipality

Access to the site can be obtained by:

- From Durban: Get onto the N3 West from Durban, following signs toward Pietermaritzburg.
- Continue on the N3: Follow the N3 West past Pietermaritzburg and continue towards Mooi River /Howick.
- Take the R617 Exit: Take the exit toward Bulwer / Underberg (typically at Howick/Merrivale connecting you onto the R617).
- Follow the R617: Merge onto the R617, which will guide you directly through Boston and Bulwer, leading you straight into Underberg Town.

C4.2 GEOTECHNICAL INVESTIGATION REPORT – UNDERBERG WWTW SITE

The Geotechnical Investigation Report is provided to give tenderers information regarding the existing ground conditions, soil characteristics and geotechnical properties of the site.

The report should be read in conjunction with the tender documentation and is intended to assist tenderers in understanding the anticipated ground conditions and associated construction considerations.

PART C5: DRAWINGS

The drawings issued to tenders as part of the tender documents must be regarded as provisional and preliminary. This provisionally underscores the need for the tenderer to assess the scope of work thoroughly, aiding in comprehensive planning and execution. The drawings are issued in a separate book.

The work shall be carried out in strict accordance with the latest available revision of the drawings approved for construction **(AFC),** which hold the utmost importance in the successful execution of the project.

At the commencement of the contract, the Engineer shall deliver to the Contractor copies of the approved for construction drawings and any instructions required for the commencement of the works. From time to time thereafter during the progress of the works, the Engineer may issue further drawings for construction purposes as may be necessary for adequate construction, completion, and defect correction of the works.

All drawings and specifications and copies thereof remain the property of the Employer, and it is the Contractor's responsibility to return all drawings and copies thereof to the Employer after the contract, ensuring accountability and the smooth transition of the project.

Refer to the table below for the tender drawing register.

Drawing List

V69-01-01-000-LAY-T-00	UNDERBERG WWTW LOCALITY
V69-01-01-001-SLAY-T-00	UNDERBERG WWTW SITE LAYOUT
V69-01-01-002-ELAY-T-00	ELECTRICAL LAYOUT
V69-01-01-003-EPSDET-T-00	EMERGENCY PUMP STATION DETAIL
V69-01-01-004-MCCLAY-T-00	NEW MCC ROOM
V69-01-01-005-BRDET-T-00	BLOWER ROOM DETAIL
V69-01-01-006-ANDET-T-00	ANAEROBIC TANK DETAIL
V69-01-01-007-RPDET-T-00	RECYCLE PUMP STATION DETAIL
V69-01-01-008-SLAY-T-00	STAFF FACILITY BUILDING DETAIL
V69-01-03-009-SDET-T-00	NEW DILUTION WATER TANKS
V69-01-03-010-SDET-T-00	BLOWERS' STANDARD DETAILS
V69-01-03-011-CDDET-T-00	CHLORINE DOSING ROOM
V69-01-03-012-PLAY-T-00	SST PIPE LAYOUT
V69-01-03-013-EVDET-T-00	SST ELEVATION VIEW FOR INLET AND OUTLET PIPE
V69-01-03-014-PSDET-T-00	SST PIPE SUPPORT DETAIL
V69-01-03-015A-SDET-T-00	SLUDGE DRYING BEDS 1
V69-01-03-015B-SDET-T-00	SLUDGE DRYING BEDS 2
V69-01-03-016-DSIWLAY-T-00	DUMPING SITE INLET WORKS LAYOUT
V69-01-03-017A-APDET-T-00	AERATION PIPE LAYOUT & DETAILS
V69-01-03-017B-ATDET-T-00	AERATION TANK DETAILS
V69-01-03-018-MCDET-T-00	MATURATION CANAL
V69-01-03-019-IWPDET-T-00	INLET WORKS PIPE DETAILS
V69-01-03-020-PLAY-T-00	PIPE LAYOUT - BLOWER ROOM TO NEW AERATION TANK (0.000km to 0.015km)
V69-01-03-021-PLAY-T-00	PIPE LAYOUT - BLOWER ROOM TO NEW DUMPING WORKS (0.000km to 0.012km)
V69-01-03-022-PLAY-T-00	PIPE LAYOUT - EMERGENCY PUMP STATION TO NEW DUMPING WORKS (0.000km to 0.038km)
V69-01-03-023-PLAY-T-00	PIPE LAYOUT - EMERGENCY PUMP STATION TO ANAEROBIC TANK (0.000km to 0.018km)
V69-01-03-024-PLAY-T-00	PIPE LAYOUT - SLUDGE PUMP STATION TO AERATION TANK (0.000km to 0.029km)
V69-01-03-025-PLAY-T-00	PIPE LAYOUT - ANAEROBIC TANK TO AERATION TANK (0.000km to 0.005km)
V69-01-03-026-PLAY-T-00	WALKWAY LAYOUT (0.000km to 0.033km)
V69-01-05-027-RLAY-T-00	UNDERBERG WWTW ROAD LAYOUT
V69-01-05-028-LSDET-T-00	ACCESS ROAD LONG SECTIONS
V69-01-05-029-CSDET-T-00	ACCESS ROAD CROSS SECTION
V69-01-06-030-NDWLAY-T-00	NEW DUMPING WORKS PLATFORM SECTION
V69-01-06-031-MSLAY-T-00	NEW MATURATION DAM & SLUDGE PUMP STATION PLATFORM SECTION
V69-01-06-032-ABLAY-T-00	NEW AERATOR BLOWER ROOM PLATFORM SECTION
V69-01-06-033-NSDLAY-T-00	NEW SLUDGE DRYING BEDS PLATFORM SECTION
V69-01-06-034-NEPLAY-T-00	NEW EMERGENCY PUMP STATION PLATFORM SECTION

Drawing List - Continued

V69-01-03-010-ELAY-T-01-REV.0	NEW EMERGENCY RECYCLE PUMPSTATION ELECTRICAL LAYOUT
V69-01-03-010-ELAY-T-02 REV.0	CHLORINE DOSING ROOM ELECTRICAL LAYOUT
V69-01-03-010-ELAY-T-03 REV.0	NEW PUMPSTATION ELECTRICAL AND LIGHTNING PROTECTION LAYOUT
V69-01-03-010-ELAY-T-04 REV.0	STAFF FACILITY BUILDING ELECTRICAL AND LIGHTNING PROTECTION LAYOUT
V69-01-03-010-ELAY-T-05	NEW MCC ROOM ELECTRICAL AND LIGHTNING PROTECTION LAYOUT
V69-01-03-010-ELAY-T-05 REV.0	NEW BLOWER ROOM ELECTRICAL AND LIGHTNING PROTECTION LAYOUT
V69-01-03-010-ELAY-T-01-REV.0	NEW EMERGENCY RECYCLE PUMPSTATION ELECTRICAL LAYOUT